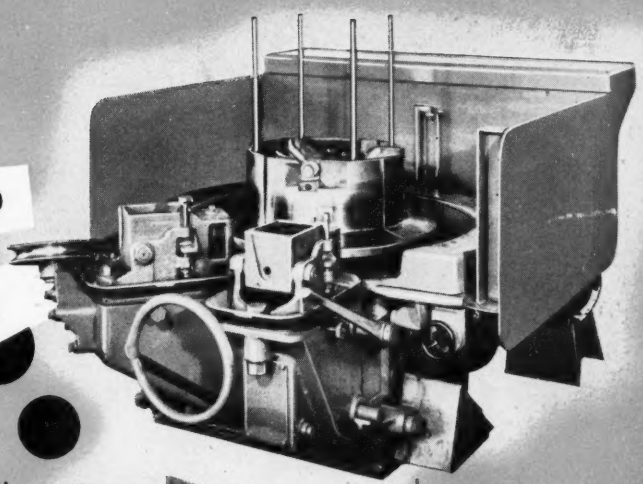
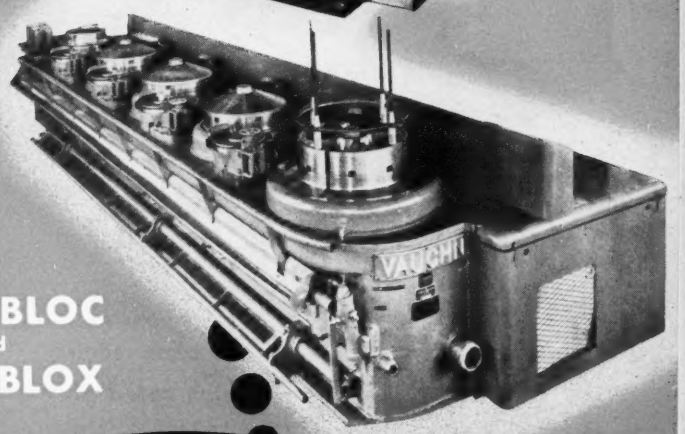
MAY 1946

WIRE AND WIRE PRODUCTS

THE *Speed* AND CAPACITY YOU NEED FOR ALL SIZES AND GRADES OF WIRE



Count on VAUGHN for dependable performance on every wire drawing assignment! Let us show you how Vaughn Equipment can handle your coming production demands.



Vaughn MOTOBLOC and MOTOBLOX

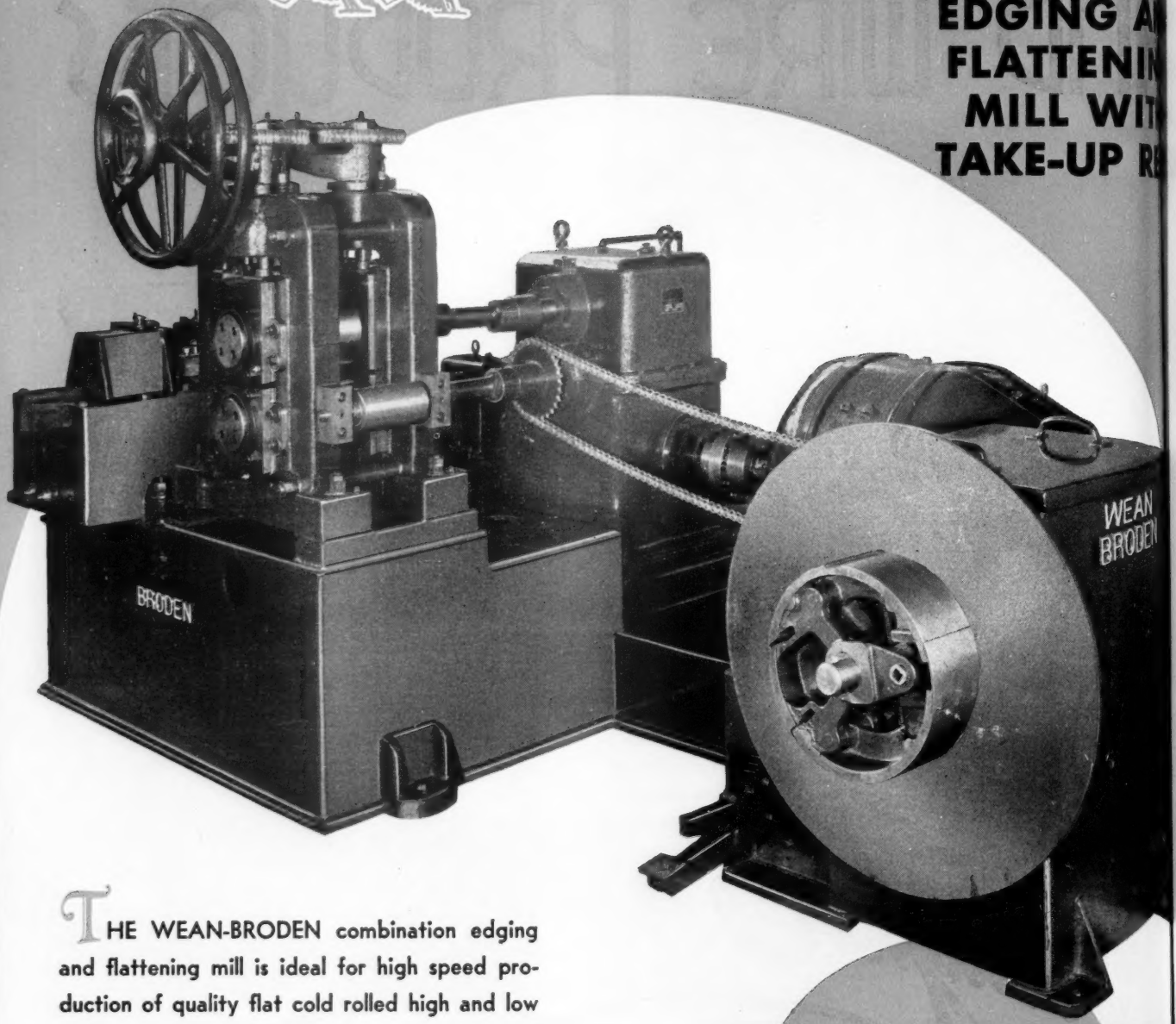
THE VAUGHN MACHINERY COMPANY
CUYAHOGA FALLS, OHIO, U. S. A.

COMPLETE COLD DRAWING EQUIPMENT . . . Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

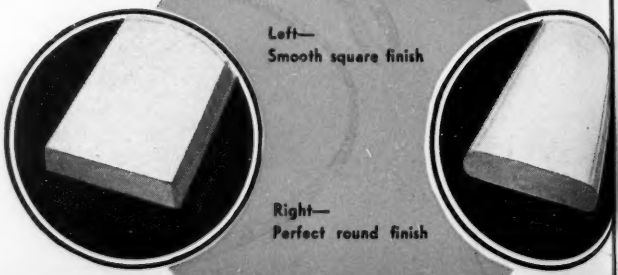
WEAN · BRODEN

EDGING A
FLATTENIN
MILL WIT
TAKE-UP R



THE WEAN-BRODEN combination edging and flattening mill is ideal for high speed production of quality flat cold rolled high and low carbon wire, with either perfect round or smooth square edge. Production speeds range up to 600 feet per minute.

The take-up reel is suitable for ribbon wound as well as thread wound coils.



Left—
Smooth square finish

Right—
Perfect round finish

The BRODEN CONSTRUCTION CO Inc. *Cleveland Ohio*

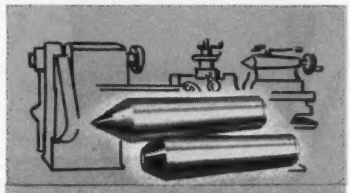
A Subsidiary Company of

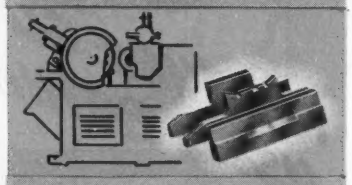
The WEAN ENGINEERING *Company Inc.* *Warren Ohio*

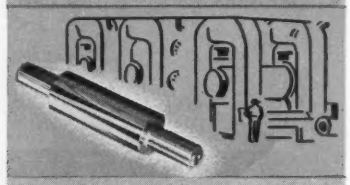
Talide
(TUNGSTEN CARBIDE)
Performance!

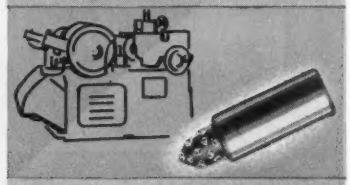
TALIDE METAL MEETS EVERY REQUIREMENT

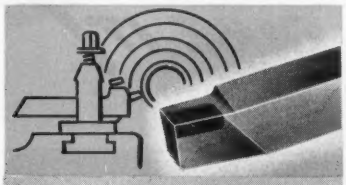
A FEW MAJOR USES FOR TALIDE METAL

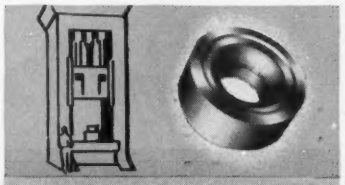

Lathe and Grinder Centers

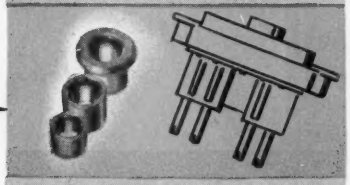

Centerless Blades


Rolling Mill Work Rolls


Diamond Wheel Dressers

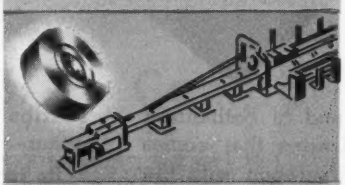

Cutting Tools


Sheet Metal Dies


Drill Jig Bushings

the hardest metal made!

Plug and Ring Gages


Wire and Tube Drawing Dies

On any cutting, drawing, or wear resistance application, you can increase production many times and cut costs as much as half. Cutting tools of Talide cut 2 to 3 times faster than high speed tool steel. Talide drawing dies and wear resistance parts usually outwear steel by at least 50 to 1.

Send us parts or prints and we will show you how this hardest man-made metal can improve your production. If you prefer, a Talide sales engineer will call at your office.

Hardest man-made metal.
Highest modulus of elasticity. (double that of steel)
Extreme Density.
Low coefficient of expansion and contraction.
High compressive strength.
High red hardness.

THE ENGINEERED CARBIDE FOR ALL APPLICATIONS

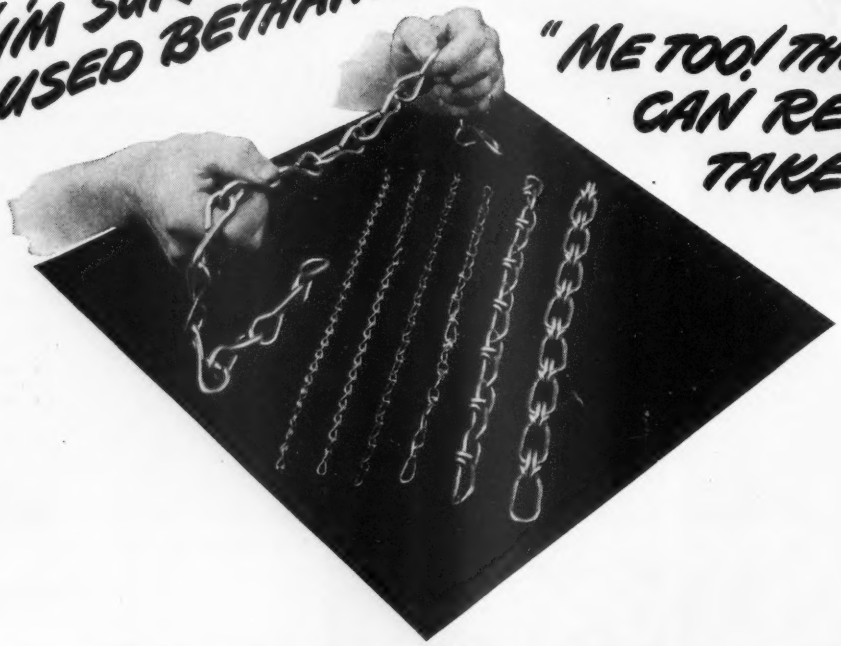
METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

SINTERED CARBIDES FOR CUTTING • HOT PRESSED CARBIDES FOR DRAWING AND WEAR RESISTANCE

"I'M SURE GLAD WE USED BETHANIZED"

"ME TOO! THE COATING CAN REALLY TAKE IT!"



Wire fabricators have a real friend in bethanized wire. For here is a zinc-coated wire that comes through even a severe forming operation with the coating undamaged.

Bethanized wire is excellent for tough forming jobs because its zinc coating is so ductile and so tightly bonded to the steel base. Locked to the base wire by an advanced electrolytic process, the bethanized coating is 99.9 per cent pure, ductile zinc. In fact the coating is so ductile that bethanized wire can be bent . . . twisted . . . wrapped around its own diameter—even drawn to fine gage—without the coating being damaged in any way.

In addition to its tightness and ductility the bethanized coating is uniform. It's so uniform—so evenly distributed, that it hasn't a thin spot anywhere, either around or along the wire.

Its remarkable uniformity together with its purity give bethanized wire another decided advantage—stubborn resistance to corrosion. And where corrosive conditions are unusually severe bethanized wire can be supplied with a coating weight up to three times as heavy as those specified in conventional Type 3 galvanizing.

Perhaps you're now manufacturing a range of products in which bethanized wire could be used to advantage. If so, just say the word, and we'll be glad to send detailed information to your desk.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

★ Bethanized Wire ★ BETHLEHEM STEEL ★

WIRE & WIRE PRODUCTS, Vol. 21, No. 5, May, 1946, Executive Office, 300 Main St., Stanford, Conn. Published by the Quinn-Brown Publishing Corp. Richard E. Brown, President; R. S. Spengel, Sec. and Treas. Publication office, 61 Cliff St., New York 7, N. Y. Subscription price: U. S., $5.00; Canada, $5.00 per year, 50 centas per copy; Foreign, $7.50 per year. Entered as second class mail at the Post Office, Stamford, Conn., Feb. 9, 1945, under Act of Mar., 1879.

APEX "PIO-KLEEN" PERFORMANCE DATA

(Case #46)

Type of Wire:	High carbon music wire
Speed:	350 ft./min.
Reduction	.130 to .0478 or 90%
No. of Dies:	6
Drum:	Dry
Tensile Strength:	300,000
Results:	On this particularly difficult draw, the use of Apex "PIO-KLEEN" was mandatory in order to obtain the above noted result.
Conclusion:	The use of Apex "PIO-KLEEN" was primarily responsible for the continued successful operation of the machine in question, under above conditions.

APEX "66" DRAWING OIL PERFORMANCE DATA

Type of Wire:	Stainless steel series 302 & 431, nickel, monel
Speed:	2200 ft./min.
Reductions:	8&8
No. of Dies:	As high as 12
Drum:	Wet
Dies:	Carbide
Results:	Any competitive products tried up to the present time have left a smut or smudge on wire after annealing. This objectionable deposit was entirely eliminated through the use of "66".
Conclusion:	It is possible to obtain maximum die life, superior finish and complete uniformity of product without the heretofore accompanying dirty wire appearance.

APEX "DRAW ALLOY PERFORMANCE DATA

(Case #52)

Type of Wire:	Copper-nickel alloy
Speed:	2200 ft./min.
Reduction:	.025 to .0063
No. of Dies:	12
Drum:	Wet
Dies:	Diamond
Results:	Production figures on the finishing die jumped from a two-numbered figure to several thousand, through the use of Apex "DRAW ALLOY". Quoting the wire-mill superintendent verbatim "we are obtaining unheard of results with Apex "DRAW ALLOY".
Conclusion:	A test-run of Apex "DRAW ALLOY" in your mill will prove its worth on all nickel-alloy wires.

In Every Extensive Comparative Test, Under Actual Everyday Working Conditions,

APEX WIRE DRAWING COMPOUNDS

Have Proved Far Superior!

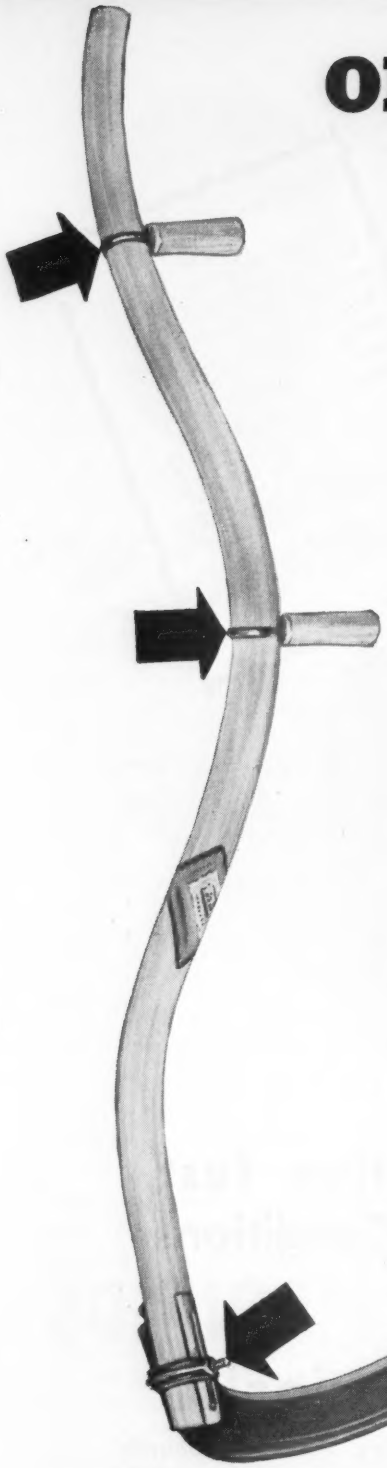
No matter what type wire, drawn wet or dry, Apex Compounds have shown superiority in speeding production and in greatly extending die life.

Why not have an Apex engineer call to discuss Wire Drawing Compounds in terms of your own requirements?

Apex Alkali Products Co.

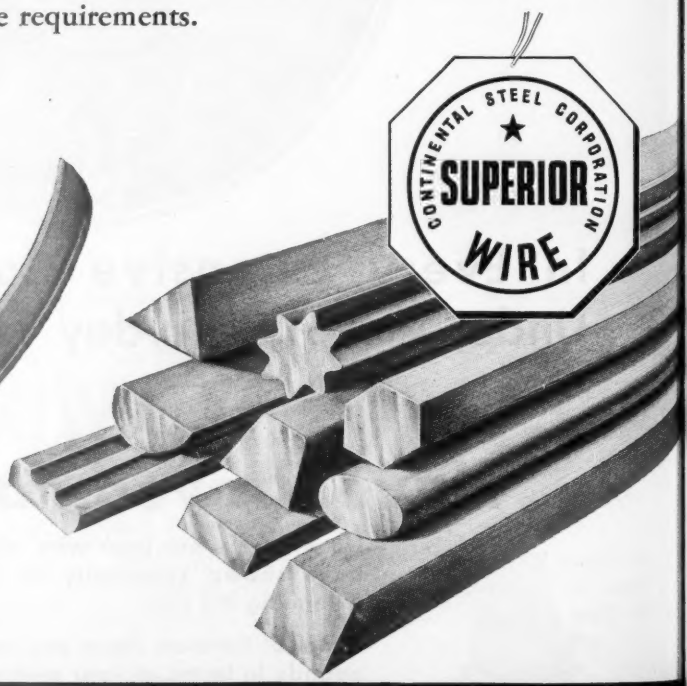
MAIN & RECTOR STS., PHILADELPHIA 27, PA. • PHONE: Manayunk 3939

ONE WAY TO "CUT DOWN PRODUCTION COSTS



● Here is how one manufacturer uses Continental wire made to special shapes. Sta-tite Snath Company of Indiana cuts production costs of their line of scythes with a specially-shaped half oval wire. Many other manufacturers are obtaining similar advantages with Continental shaped wire.

Continental wire drawn to special shapes has an important place in modern production. It adds to the utility and appearance of many products, cuts manufacturing costs and frequently saves valuable production time. There is a size, a type, and a finish in Continental standard or special shaped wire to fit many needs in manufacture. Write us today about your wire requirements.

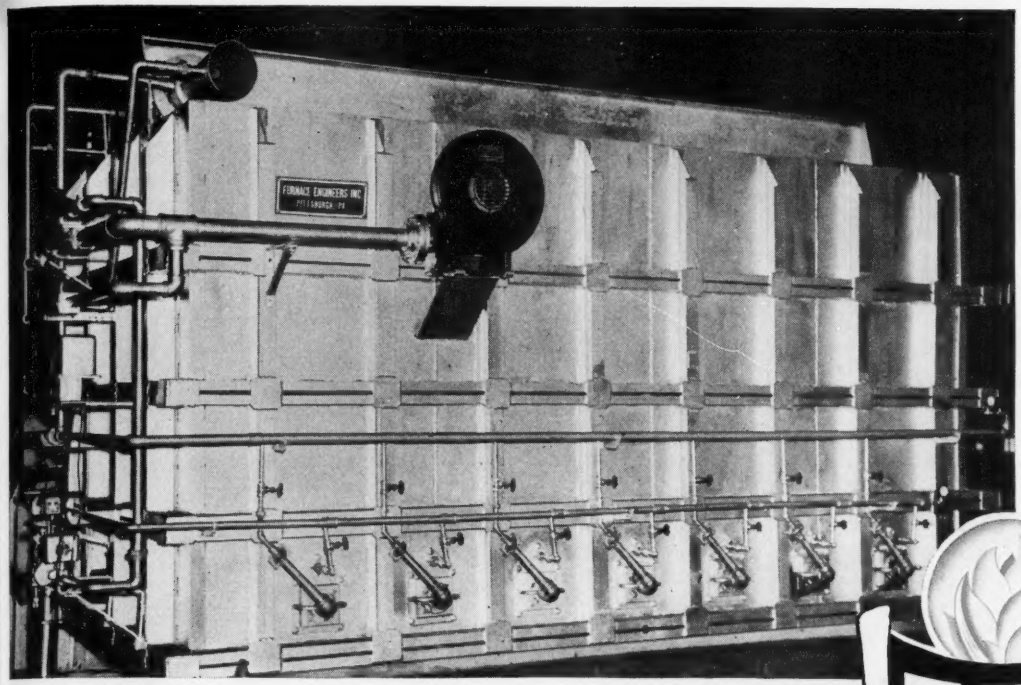


CONTINENTAL SUPERIOR STEEL

CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO, INDIANA

PRODUCERS OF *Manufacturer's Wire* in many sizes, shapes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.



F.E.I.

To cost-minded production men, the story of F. E. I. direct-fired Cover Annealing Furnaces is proving of more than ordinary interest. These furnaces are, indeed,

making history in production heating

When you investigate and find out what they have done, and are doing, to step up production per furnace, to improve control, quality and uniformity (practically eliminating "stickers" and rejects in coils and flats)—you'll sing their praises, too. It's a case of shaving not merely nickels and dimes, but dollars, from the cost per ton. Even on fuel cost alone—an item often looked upon as of no importance—savings of fifty cents to a dollar per ton have been made, in comparison with equipment heretofore considered tops in the heating field.

The significant facts about F.E.I. performance records are yours for the asking, as are the services of our engineers in helping you install new, or convert old cover furnaces to obtain greatly lowered heating cost.

★ ★ ★ F. E. I. EQUIPMENT ★ ★ ★

Direct Fired Cover Furnaces for Annealing, Spheroidizing, Normalizing and Bright Annealing of wire, rods, coiled strip, flat sheets and tin plate.

Convection Bases especially designed for heavy coil loads, give 200% to 400% longer life.

Galvanizing, Patenting, and ***Normalizing Furnaces*** for WIRE, BAR, and TUBE MILLS.

Galvanizing Furnaces for Pipe, Sheet and Job Plants.

FURNACE ENGINEERS, *Inc.*

Specializing in the design, manufacture and installation of furnaces for the metal working industries

1551 WEST LIBERTY AVENUE ★ PITTSBURGH, PA.

NO MORE LIMING!

Reduce Rejects... Improve Finish... Cut Costs... End Liming with MAGNUS METAL COAT No. 267

For more than three years, Magnus Metal Coat #267 has been in full scale use in many wire mills, where it has thoroughly demonstrated its ability to accomplish the following specific results:

REDUCED REJECTS—Off-size wire and scratching are practically eliminated.

IMPROVED FINISH—On bright, welding, rope, tire bead wire particularly. A better finish is also provided for all wires drawn for metallic coatings and other special finishes. The final user of wire drawn with Magnus Metal Coat #267 is saved many a troublesome cleaning job which he formerly had to face when ordinary liming was employed.

NO LIMING—Magnus Metal Coat #267 completely eliminates the use of lime and hence any need for baking. The pickled wire, after rinsing, is dipped for three minutes in Metal Coat #267, dried and drawn without further treatment. Hydrogen embrittlement is eliminated right in the coating solution.

BETTER RUST-PROOFING—Materially improved rust-proofing is obtained when Metal Coat #267 is used.

LOWER LUBRICANT COSTS—A very lean lubricant is used for best results with Magnus Metal Coat #267. Savings here may mount to as high as 50%.

LONGER DIE LIFE—Magnus Metal Coat #267 tends to lengthen die life on any drawing operation, but on continuous high speed machines, economies in longer die life are particularly attractive.

OVERALL DRAWING COSTS CUT—The final cost per ton of drawn and finished wire is much lower than with the conventional lime method.

CLEANER HANDLING—Without lime, machines and surroundings are much cleaner, and working conditions materially improved.

Lubricants for use with METAL COAT #267

For best results, we suggest Dri-Draw #6 for ordinary dry drawing, and Dri-Draw #91 for bright one-hole wire. For high speed continuous wet drawing machines, Magnus Wet-Draw #40F — the new non-foaming lubricant — will be found to be most satisfactory.

Let us make specific recommendations on the use of Magnus Metal Coat #267 on one or more of your drawing operations.

1921-1946 TWENTY-FIVE YEARS OF SERVICE TO INDUSTRY

MAGNUS

MAGNUS CHEMICAL CO., 188 SOUTH AVE., GARWOOD, N. J.

Wire Drawing Compounds

Surer even than a pilot's eyes

. . . the high-frequency cable that makes **RADAR** *possible*

is insulated with

Du Pont POLYTHENE

CUT-BACK SECTION of a modern twin coaxial cable for use in direction-finding equipment at ultra-high frequencies (400 to 10,000 megacycles). JAN-C-17 designation RG-23/U; made by Anaconda Wire & Cable Co. The insulation, about 140-150 mils thick, is Du Pont polythene.

Radar and associated electronic developments, born in stress of war, have important peacetime uses immediately ahead. Ships and planes which, without radar, might be hopelessly lost in foul weather or fog, may now soon be located ...come safely to harbor or airport... thanks to one or several of the four main types of radar.

In this important work Du Pont polythene plays an indispensable part. For radar depends on ultra-high frequencies —anywhere from 2 to 10,000 megacycles! The cables that carry these currents must have an insulating material of low electrical losses—which at the same time is flexible at low temperatures. *Du Pont polythene meets both these requirements.*

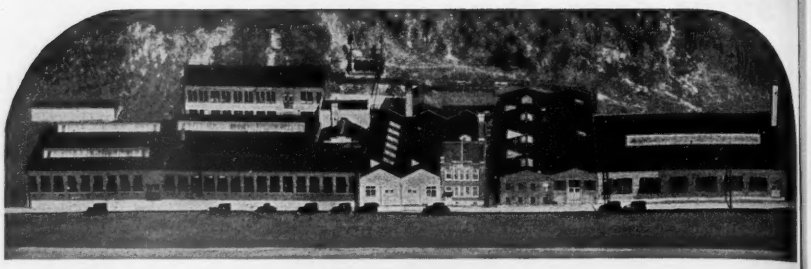
Other properties of Du Pont polythene: outstanding chemical inertness, light weight (specific gravity 0.92), low moisture permeability, flexibility in thin sections, rigidity in thick. For complete data sheet, write to E. I. du Pont de Nemours & Co. (Inc.), Plastics Dept., Room 145, Arlington, N. J.

Du Pont manufactures polythene molding powder.

Commercial extruders convert polythene into the forms of

DU PONT
REG. U. S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

HUDCO



HUDSON WIRE CO. PLANT AT OSSINING, N. Y.

This plant is one of the most up-to-date and completely equipped plants in the world for the production of "HUDCO" fine wires in all metals.

ESTABLISHED IN 1902

HUDCO

WIRES FOR METAL SPRAYING

Pure lead, Lead Alloy, Pure Zinc, Zinc Alloy, Copper, Tin, High Brass, Low Brass, Solder Wire. High Conductivity, Electric Wire. Cadmium, Nickel Silver, Aluminum, Monel Metal, Phosphor Bronze, Pure Nickel, Commercial Bronze, Brush Wires, Crimp and Straight, Brass, Steel, Nickel Silver, Copper and Phosphor Bronze.

HUDCO

FINE BARE WIRES

High Brass, Low Brass, Zinz 99.99+ and High Tensile Zinc, Commercial Bronze, Phosphor Bronze, Pure Tin, Lead, Antimonial Lead, Tinsel Lahns, Silver Plated Copper, False Gold and Copper. Cadmium, Nickel Silver, Silver Plated Copper, False Gold and Special Brass and Bronze Alloys to Specification, Metallic Fibre for Packing Purposes, Copper, Bronze, Zinc, Lead and Aluminum.

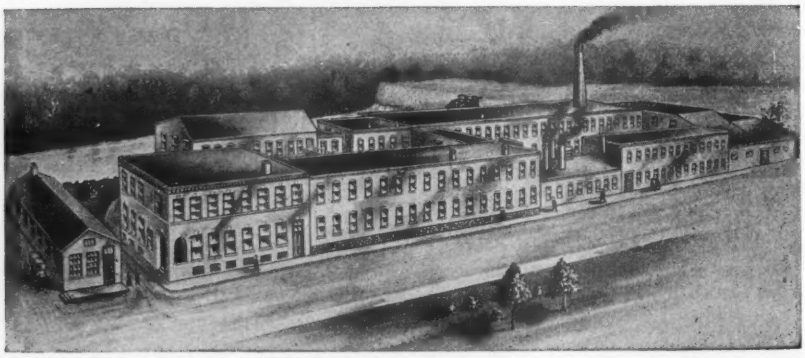
"HUDCO" specially processed Copper Wire for enamelling purposes is drawn from selected Copper, insuring the maximum conductivity. This is but one example of the use of the most advanced and approved materials and methods in our processing.

BETTER WIRE AT LOWER COST

Send Us Your Specifications and Let Us Quote Prices

HUDSON WIRE COMPANY • OSSINING, N. Y.

WINCO



Winsted Division of HUDSON WIRE CO. at Winsted, Conn., modern and completely equiped enamelled wire plant for LEAKPROOF ENAMELLED WIRE and all standard and special coverings.

"WINCO" enamelled wire is drawn from special selected copper, assuring perfect enamelling. All wire tested before shipment.

"WINCO" enamelled wire is available in all standard and special coverings made to meet exacting requirements.

Samples of LEAKPROOF and other enamelled wires sent on request

WINSTED DIVISION OF HUDSON WIRE COMPANY

WINSTED, CONN

SAVINGS CLEAR AS GLASS

With HEAVY lime

With LIGHT lime

in the use of

STANDARD INDUSTRIAL COMPOUNDS

WIRE DRAWING LUBRICANTS ---

It has long been our opinion that with the use of Standard Lubricants a much lighter lime coating should be used on rods or wire.

Our reasons for this are:

1. It prevents dilution of the lubricant and consequent waste by filling of the box as shown above.
2. It permits the penetration of the lubricant to the metal, and consequently better adhesion.
3. It prevents packing in the die.
4. Excessive lime causes peeling of the coating and galling and scratching in the die.
5. Lime is dry and abrasive unless mixed intimately with the lubricant.
6. Many mills have proven by actual test that cutting the lime coating by 1/3 to 1/2 has improved die life and also made it possible to draw more holes with one lubrication.
7. With less lime the amount of lubricant used was cut down by prevention of waste and by not feeding an excess through the first die.
8. By using a very light lime, use of substitute coatings at higher cost is also prevented.
9. Lime dust from heavy coatings are not left on floor, machines, or in the air.

Standardize with Standard

STANDARD INDUSTRIAL COMPOUNDS COMPANY

4600 W. Ferdinand Street, Chicago 44, Ill.

Standardize with Standard

PRODUCTION STEEL NOW!

Government-owned High Quality Surplus Priced For Substitute Uses

If you need fabricating bar alloy stock now and are willing to adapt top quality material priced at or near carbon steel prices—here is real opportunity. Over 25,000 tons of hot rolled and 25,000 tons of cold finished carbon and alloy steel bars are ready for immediate shipment to you. The stock is available in standard sizes, shapes, but is of above average grades. Accordingly it has been priced at levels such as to insure its quick employment to meet America's postwar needs. For details on F.O.B. locations, sizes, quantities and shipping arrangements contact your nearest W. A. A. Regional Office below . . . or clip and mail this coupon.

VETERANS OF WORLD WAR II: To help you in purchasing surplus property from W. A. A. a veterans' unit has been established in each of our Regional Offices.

FREE INFORMATION

To War Assets Administration:
Please send me information on the availability and pricing of the following:

Carbon and Alloy Billets, Blooms, Slabs, Rods, etc. ☐
H. R. & C. F. Alloy Sheets, Strips and Plates ☐
Stainless Steel Sheets, Strips, Standard Types ☐
Valves and Fittings ☐
Mechanical Tubing, Carbon and Alloy ☐

NAME ..... TEL. NO. .....

FIRM .....

ADDRESS .....

CITY ..... STATE .....

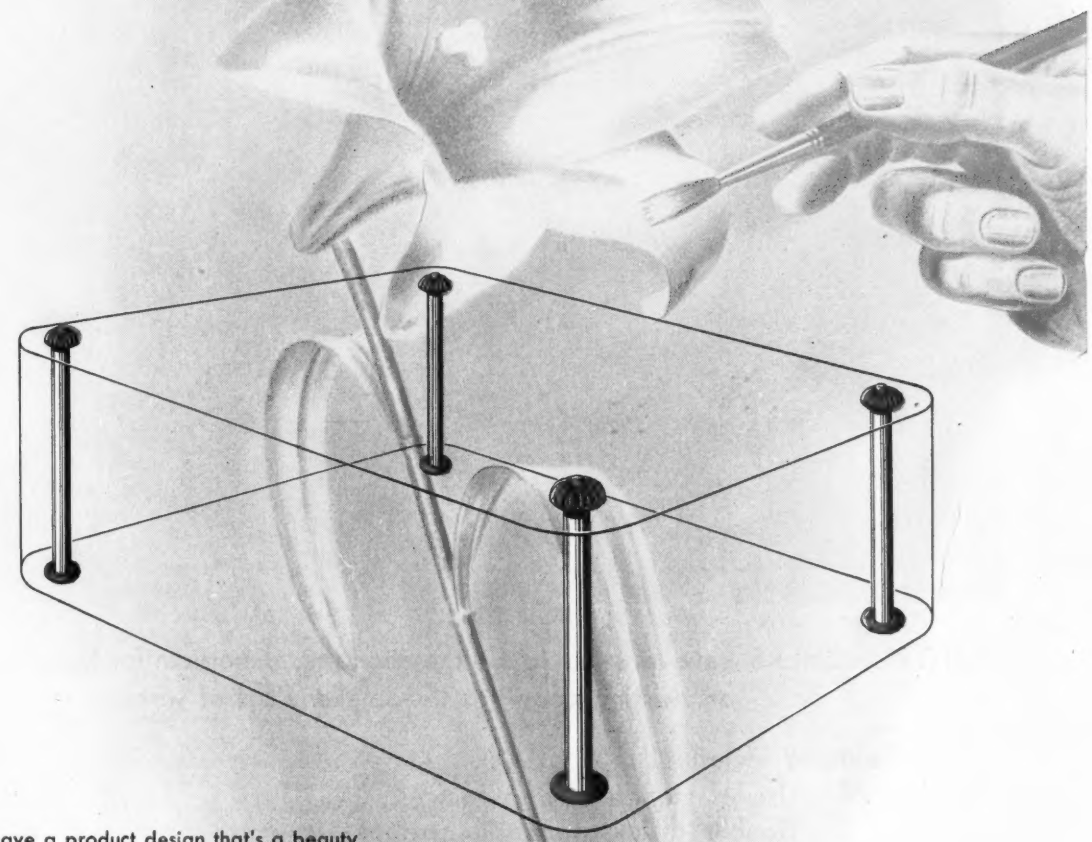
157-5

WAR ASSETS ADMINISTRATION

OFFICES LISTED BELOW ARE TEMPORARILY IN RECONSTRUCTION FINANCE CORPORATION AGENCIES

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cleveland • Dallas • Denver Detroit • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville Minneapolis • Nashville • New Orleans • New York • Oklahoma City • Omaha • Philadelphia Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane Cincinnati • Fort Worth (Telephone 3-5381)

WHY NOT Gild the Lily?

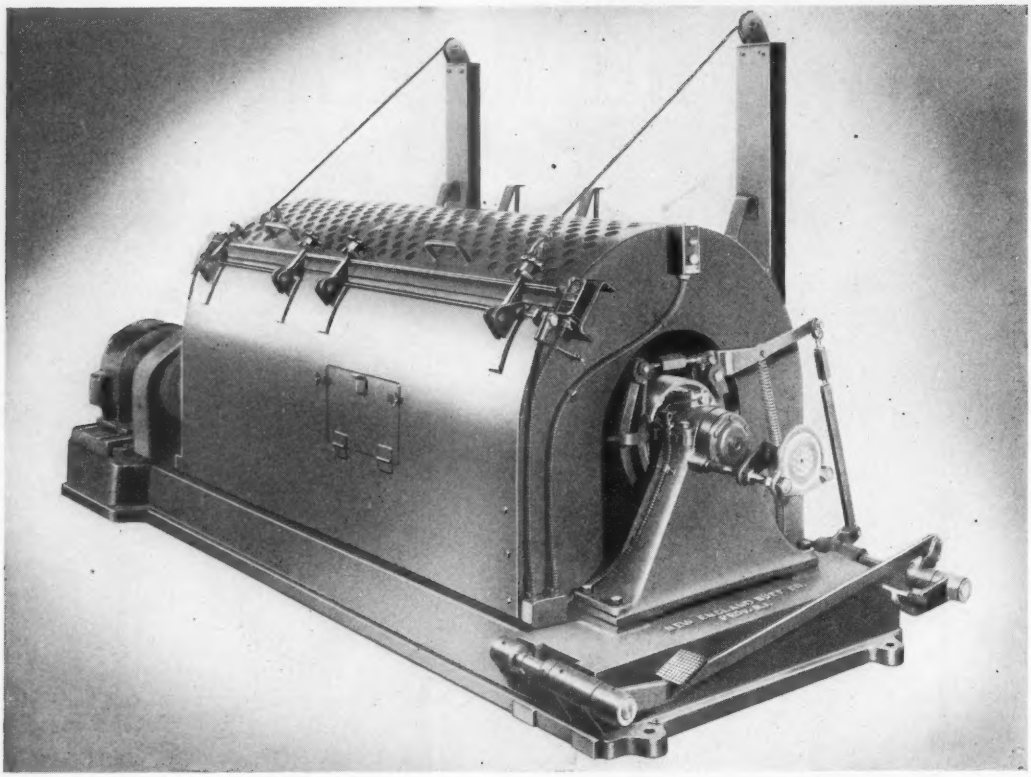


You have a product design that's a beauty . . .
to be produced in plastic, leather, wood or metal.
It has to be held together in some way, so why not make Alcoa Aluminum fastening devices part of the design?
Alcoa Aluminum can be given any number of attractive and unusual finishes and colors which give added eye appeal.
Product designers and manufacturers should have Alcoa's booklet, "Finishes for Aluminum", to help them use aluminum fastening devices to better advantage.
Call the nearby Alcoa office for a copy, or write ALUMINUM COMPANY OF AMERICA, 1828 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM

HIGH SPEED BUNCHER



BUTT BUNCHERS have proved to be the economical medium for bunching or twisting together the smaller sizes of wires.

Features include:

- Use of standard shop reels
- Double drum grooved capstans
- Quick acting electrically operated brakes
- Substantial guards and safety features
- Anti-friction bearings
- Sturdy construction with low center of gravity

These machines are built in two sizes:

- S-31 for strands up to No. 14
- S-35 for strands up to No. 8

Write for circular No. 63 for details

NEW ENGLAND BUTT COMPANY

ESTABLISHED 1842
304 PEARL STREET
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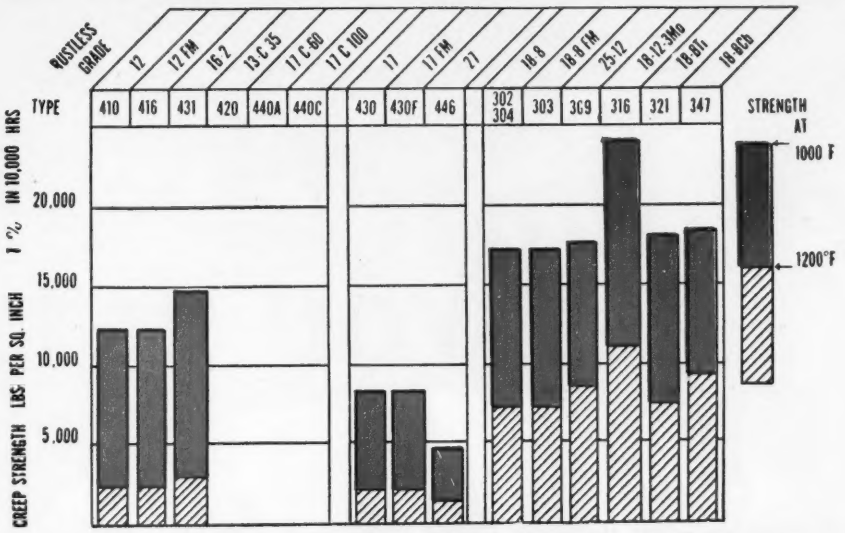
James Day (Machinery) Ltd., "Ford House," 88 Regent St., London., W.I., England

RUSTLESS DATA SHEET NO. 3

Corrosion Resistance Plus Strength at High Temperatures

One of the Many Combinations of Properties Offered by Stainless Steels



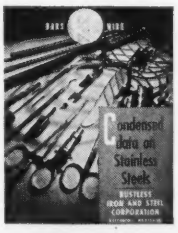
PERHAPS a better name for "stainless steels" would be "corrosion and *heat*-resisting steels." Actually, engineers figure one of the most valuable properties of these alloys is their ability to retain unusual strength and resist deformation at temperatures far beyond the softening points of most metals. Couple this with the ability of stainless steels to withstand the withering effect of greatly accelerated corrosion and scaling conditions, and you have the reasons for its extensive use in furnaces, petroleum cracking stills and accessory equipment, high temperature chemical processes, turbine blading, spark plug electrodes, internal combustion engine exhaust valves, glass molds, turbo-superchargers and aircraft engine exhaust manifolds and stacks.

There are many ways to measure strength at high temperatures: (1) "Creep" tests which measure the maximum load a material will carry for long periods of time without "creeping" or stretching more than some specified small amount; (2) Stress-Rupture tests, which measure the load carrying ability at high temperature; (3) Tensile tests, wherein the material is pulled apart in a relatively short time after reaching high temperatures; (4) Hot-Hardness tests useful in connection with exhaust valve materials.

A brief review of the above chart indicates that for products involving long exposure to temperatures exceeding 1200°F., the chromium-nickel or austenitic grades are best when heavy loads are to be carried. Note that outstanding in this group is Rustless 18-12-3 Mo, Type 316, containing molybdenum. This is the grade widely used for its excellent resistance to hot corrosive gases. When stresses are low, Rustless 27, Type 446, is still a candidate for selection because of its good resistance to oxidation up to 2000°F. The chromium-hardenable group on the left are subject to rapid softening over 1000°F. because they temper rapidly when this temperature is exceeded. Up to that point they are widely used for valve trim as they faithfully retain their hardness and erosion resistance. It should also be noted that a modified Type 410 is the outstanding material for steam turbine blading.

Of course, there is more to this subject than covered here. When you want to have it—just call Rustless. Write or wire—there is no obligation.

We have a vast amount of stainless steel information applicable to the solution of high-temperature problems. Write us the details of your specific case or cases, and the Rustless engineers will gladly cooperate with you, both in selection and fabrication. Or send for helpful literature; for example, "Condensed Data on Stainless Steels," which will be sent on request.



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DIVISION OF ARMCO

RUSTLESS IRON AND STEEL DIVISION

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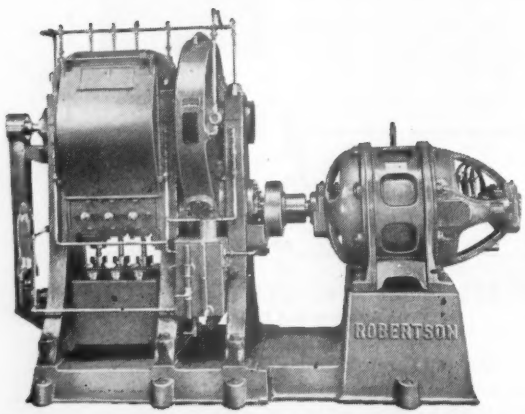
Are you receiving "Robertson Reminders," our frequently-published booklet? If not, please write to us on your business letterhead, and we shall be happy to see that you receive each issue.



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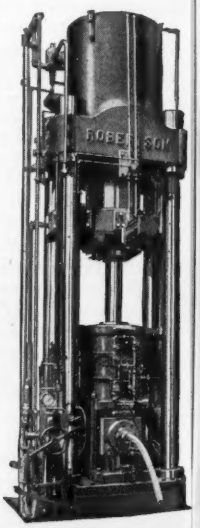

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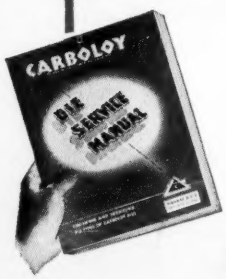

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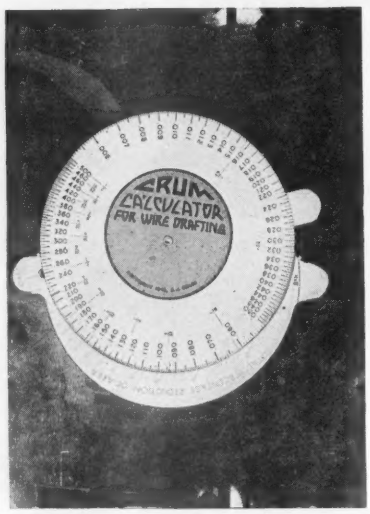
This simplified calculator will show quickly and accurately the whole picture of a given wire drawing mathematical problem in one setting without running off the scale, using a slide or other auxiliary equipment. A practical, time-saving device that will avoid the possibility of errors of calculation.



The instrument can be set rapidly to show the number of holes, the percentage of draft per hole, the total reduction of area, the intermediate die sizes and other special information required by the user. Most problems can be solved in one setting. Covers drafting range of .500″ to .005″. Accurate enough for most mill conditions.

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1. Simple to operate. Can be learned by anyone in a few minutes.
2. Compact. Can be carried in a vest pocket.
3. Universal. With the circular scale there are neither upper nor lower limits on diameters for which it can be used.
4. Versatile. Practically all common wire mill drafting calculations can be solved on it.
5. No gauge confusion. All diameters given in decimals.
6. Diameters in the metric as well as the English system can be used.

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HOW TO ORDER

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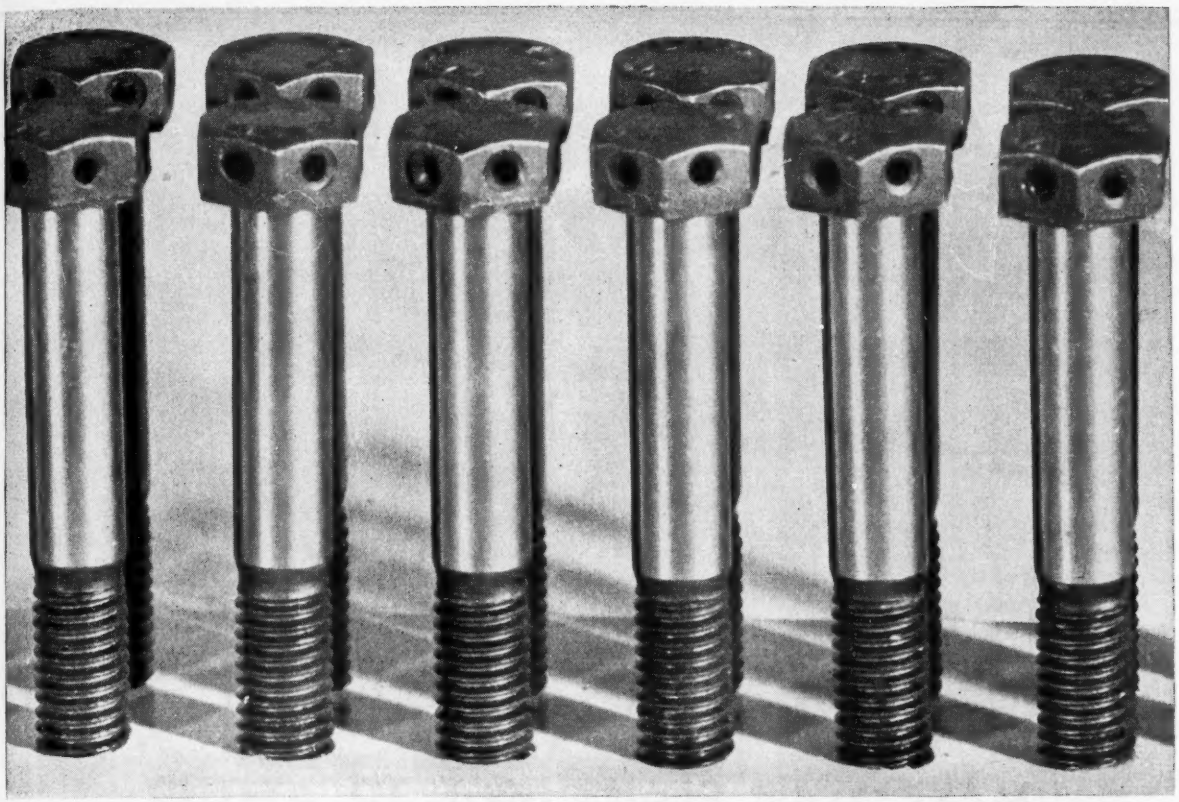

THEY DON'T LOSE THEIR HEADS

in tough situations

TRIED and true, these rugged regulars stand up. They hold in tight places. They take plenty of punishment without giving way. They have toughness and strength and endurance. They are cold-headed bolts produced from Youngstown Alloy Steel.

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will be held in

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The Meeting will start at 6 p. m.

MAKE YOUR PLANS NOW TO ATTEND

This important session will feature a talk by Wallace G. Imhoff, nationally known authority on galvanizing and metal protective coatings, in which he will present a thorough discussion on various inhibitors and their applications.

Following Mr. Imhoff's presentation, a sound motion picture on swaging will be shown. This picture has been furnished by and will be shown through the courtesy of The Standard Machinery Company of Providence, Rhode Island.

Earl R. Potter, Superintendent of the Industrial Wire Products Corporation, San Francisco, will serve as chairman of the meeting and introduce Mr. Imhoff.

Registration fee, including dinner, $4.00

Please send your reservations immediately, stating whether you will require hotel accommodations, to

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

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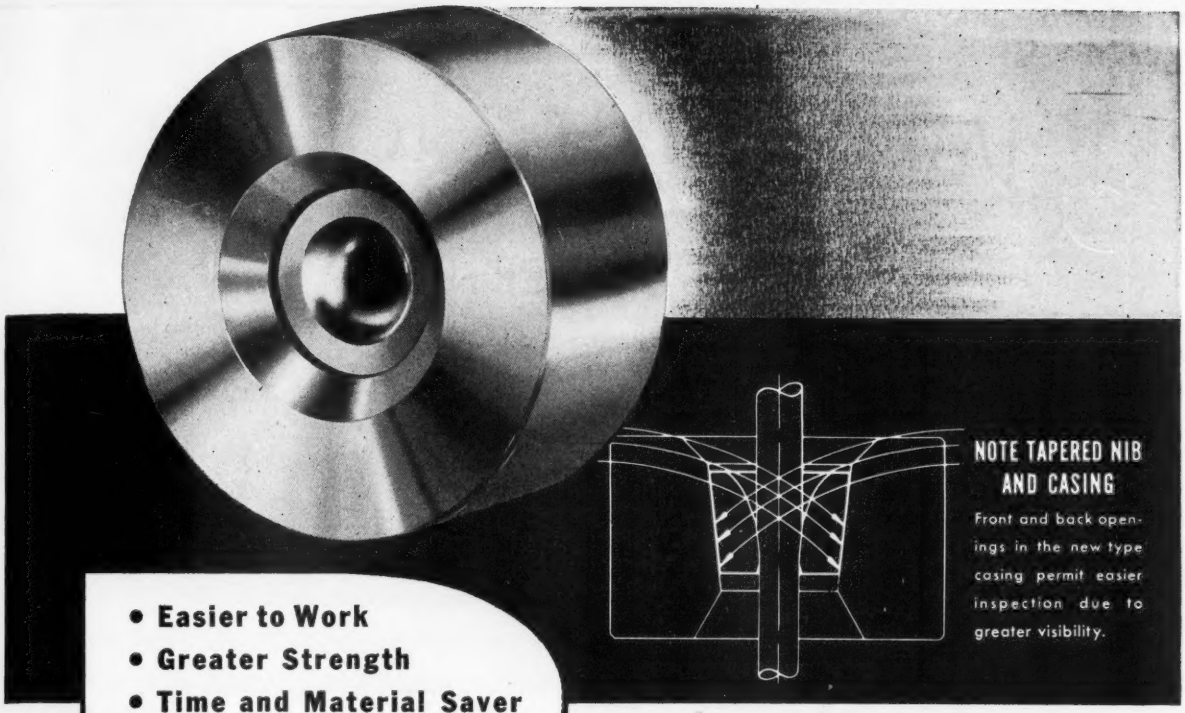

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- Easier to Work
- Greater Strength
- Time and Material Saver
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- Full Visibility

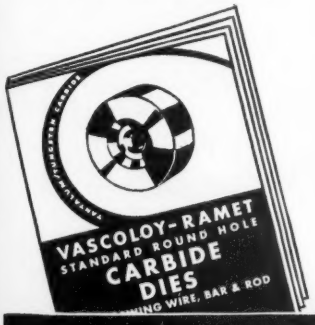
VASCOLOY-RAMET

Tantalum/Tungsten

Carbide Dies . . .

. . . for Drawing Wire, Bar and Rod

A BOOK ON STANDARD ROUND HOLE DIES just off the press will be helpful to you. Write us for Bulletin VR348.



Maintain size longer and produce better finish. Tantalum/Tungsten Carbide has a lubricating characteristic which greatly reduces mechanical resistance in drawing, and in so doing, enables a much smoother finish. Many mills report longer productive life, less down time, greater tonnage per die and greater operator satisfaction.

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regarding the

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* * *

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Members of The WIRE ASSOCIATION will continue to receive a copy of the BUYERS GUIDE as part of the service extended to them, and the cost is included in the dues.

TO ALL OTHERS THE PRICE REMAINS AS HERETOFORE, $5.00 PER COPY.

THE BUYERS GUIDE is a complete directory of all kinds of wire and wire products manufactured in this country, together with listings of all manufacturers of machinery, equipment, supplies and services used by the Wire Industry.

It is an invaluable source of information on everything of interest to wire men. Be sure to order your copy early to be certain of getting one, as the edition is limited. Published in the Spring annually. Only $3.00 to subscribers.

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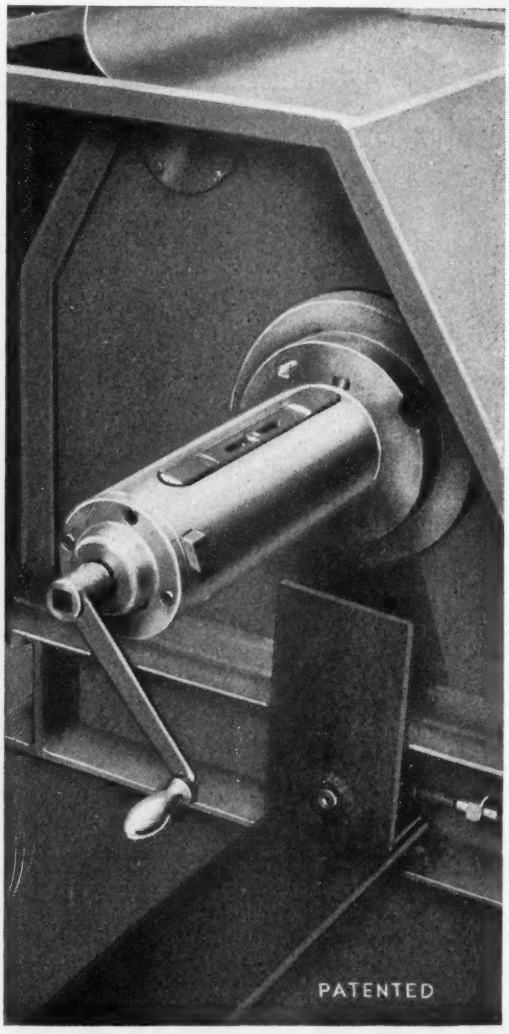
one of several important features of the SYNCRO Expanding Spooler Arbor



Safe . . . . .

The spool is held with a bull dog grip. It cannot move in any direction on the Syncro Expanding Spooler Arbor.

Vibrationless . .

The spool is solidly held by the Syncro Expanding Spooler Arbor. It cannot set up destructive vibration.

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The Syncro Expanding Spooler Arbor compensates for out-of-round spool bores. It eliminates considerable refinishing of spools.

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The Syncro Expanding Spooler Arbor speeds mounting and removal of spools.

The patented Syncro Expanding Spooler Arbor can be applied to many existing spoolers. It is available in sizes to accommodate standard sool bores. Write for complete details.

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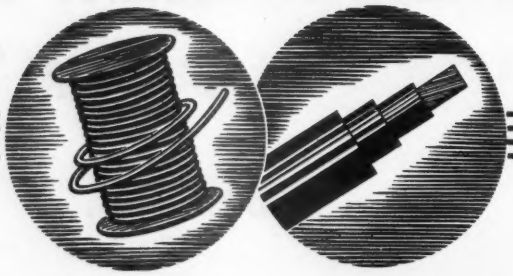

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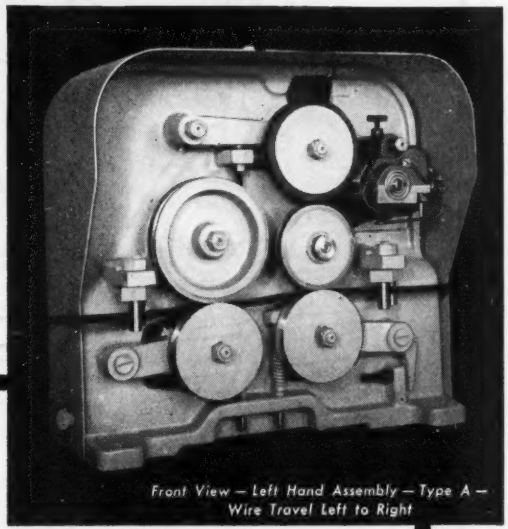
TYPE A-2 • For use in printing or striping in any one color on one side of wire from 1/2" to 2" in diameter.

TYPE B • For use in printing or striping in any one color on two sides (180° apart) of wire from 1/16" to 1/2" in diameter.

Machine is operated by the moving wire, thus eliminating the problem of synchronizing the machine speed and the wire speed.



Front View — Left Hand Assembly — Type A — Wire Travel Left to Right

INK INFORMATION • *available colors*

Pink, Red, Orange, Yellow, Light Green, Dark Green, Light Blue, Dark Blue, Purple, Tan, Brown, White, Black, Silver, Gray.

TYPE 100 INK ***(All Colors)*** • For use in printing or striping in all colors on rubber and synthetic rubber compounds. For use in printing in all colors except black and purple on cold thermoplastics.

TYPE 100F ***(All Colors)*** • Same as 100 — but much faster drying.

TYPE 100W ***(All Colors)*** • For use on any compound over which a coating of hot wax is applied immediately after printing.

TYPE 200 INK ***(All Colors)*** • For use in printing in black and purple on cold thermoplastics. For use in striping in all colors on cold thermoplastics. Not particularly resistant to high concentration of ultraviolet light in hot, moist atmosphere.

TYPE 300 INK ***(All Colors Except Black and Purple)*** • For use in printing or striping in all colors except black and purple on cold thermoplastics. Very resistant to high concentration of ultraviolet light in hot, moist atmosphere.

TYPE 300A INK ***(Black and Purple)*** • For use in printing or striping in Black and Purple only on cold thermoplastics. Very resistant to high concentration of ultraviolet light in hot, moist atmosphere.

TYPE 800 INKS • For use in printing or striping on hot thermoplastics.

TYPE 400 CLEANER • For use in cleaning only, all inks from reservoirs, type strips, transfer rolls etc.

TYPE 500 THINNER • Should be used to thin type 100, 100F and 100W inks only.

TYPE 600 THINNER • Should be used to thin type 200, 300 and 300A inks only.

TYPE 700 THINNER • Should be used to thin type 800 inks only.

JLE Wire Marking Machines are licensed under the following patents. Schake, No. 1,958,717 and Phillips, No. 2,186,555.

Ink Reservoirs are patented under No. 2,312,053 and No. 2,232,274. Other patents are pending.

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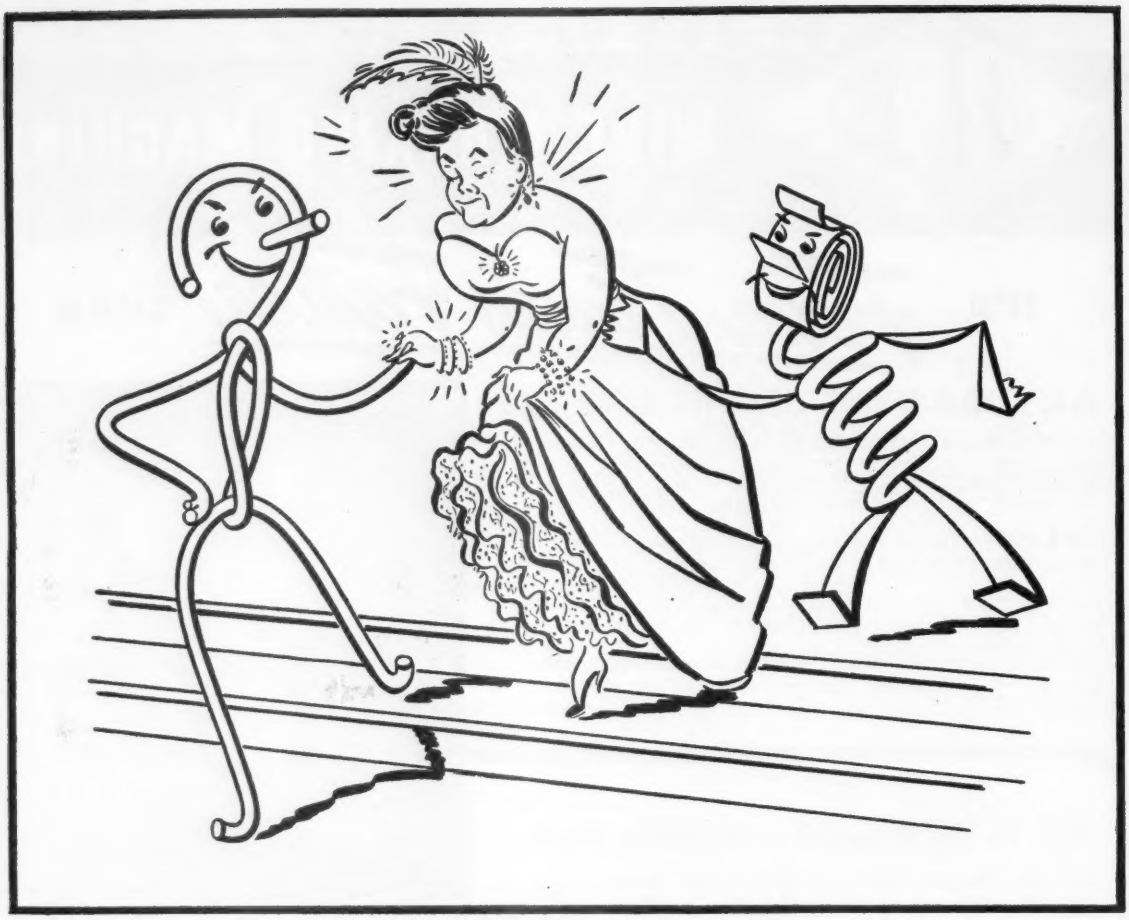

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Whether you order in small quantities or carload lots you can be sure of special attention. Our metallurgists are ready to cooperate in the solution of your wire problems. Our mills can meet the most exacting specifications. And our constantly growing volume of repeat orders is evidence of satisfactory service.

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The Wire Outlook

The Administration's long years of vote nurturing, regardless of the welfare of the country, is bearing fruit—more strikes, inflation, unrest and scarcity of goods. Steel production in mid-April dropped to 77.4% of capacity for lack of coal at a time when it should have been gathering momentum. A total of only 50 million tons is indicated for the year.

Shortages of steel will afflict industry for another four or five months, with demand far exceeding supply. Copper will be fairly plentiful this year, an acute shortage having been averted by foreign purchases. Tin should become easier after June, permitting a relaxation of controls. Imports and release of Government stockpiles are helping. Cadmium will be scarce indefinitely. Lead will grow worse throughout the year, with a curtailment of its domestic uses in prospect. Rubber will be short for two years, throwing a heavy burden on plastics, which while short, will be increased in supply in 1947 by 30%.

As machinery manufacturers see an opportunity to produce new equipment at a profit, watch for better and faster machines—straightener and cutters, furnaces, wire-drawing blocks, centerless grinders. Keep your eyes on reactive wire-drawing. It is bound to come—England is already stirred up over its possibilities. Two years ago everyone was talking continuous production. Today it has almost dropped from the picture, due to sacrifices in quality resulting from efforts to secure speed. However, the "bugs' will be ironed out and continuous processes will again appear.

Demand for wire rods so far outstrips supply that many non-integrated mills face shut-downs. Some price increases have discouraged production of certain items, like barbed wire and nails, but farm fencing and wire fabrics are slated for an increase of production. Tire bead and bed spring wire are hard to get. The automotive industry's demand for high carbon wire has made it very tight. The fact that nails are unattractive to make, poses a problem for the building industry, which will require 12,500,000 kegs in the next two years to meet the production program. Fasteners—bolts, nuts, screws, rivets—especially in smaller sizes, are in heavy demand by manufacturers of consumer goods, but manufacturers are not feeling too enthusiastic about the inadequate 7% price increase recently allowed. One large tack maker is operating on three shifts and has stopped exporting in an effort to supply domestic markets. Copper wire and brass mills face an unprecedented demand this year as a result of the housing schedule. Radio set production is taking a lot of wire, 1,100,000 sets having been shipped in February, with increases in prospect as wire, speakers, cabinets, and other parts become available. Fine wire will probably be made in increasing quantities. Heavy demand is seen for tire bead, brush, recording, and wire for electronic devices.

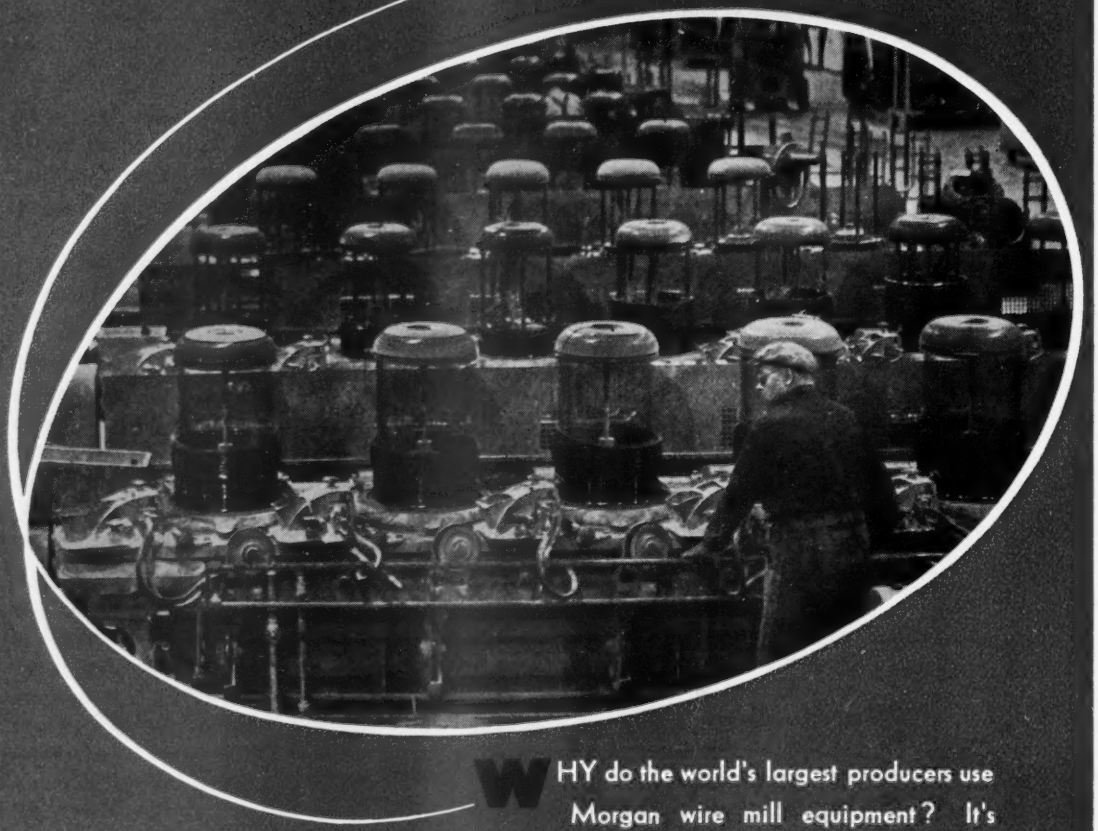
Steel companies, although harassed by economic uncertainties, plan extraordinary expenditures in 1946 for additional facilities to meet post-war demands — some $327,000,000. Most of this will go for new machinery and equipment.

The stage is set for prosperous times. The question is, will Government continue to coddle and cater to radical reformers or make a forthright effort to materialize the prosperity that all might enjoy?

—from the Editor's Desk

MORGAN
WORCESTER

accents **Results**



WHY do the world's largest producers use Morgan wire mill equipment? It's because they get *results*. *Results* in increased output . . . *results* in reduced costs . . . *results* in greater operating efficiency.

Why does Morgan equipment give results? Because it is engineered with imagination and made practical through many years of daily contacts with mill men and intimate discussion of their problems.

For better results from your new mill or modernization program why not see what Morgan has to suggest?

Morgan Construction Company

WORCESTER, MASS.

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 21 MAY, 1946 No. 5

Designated as
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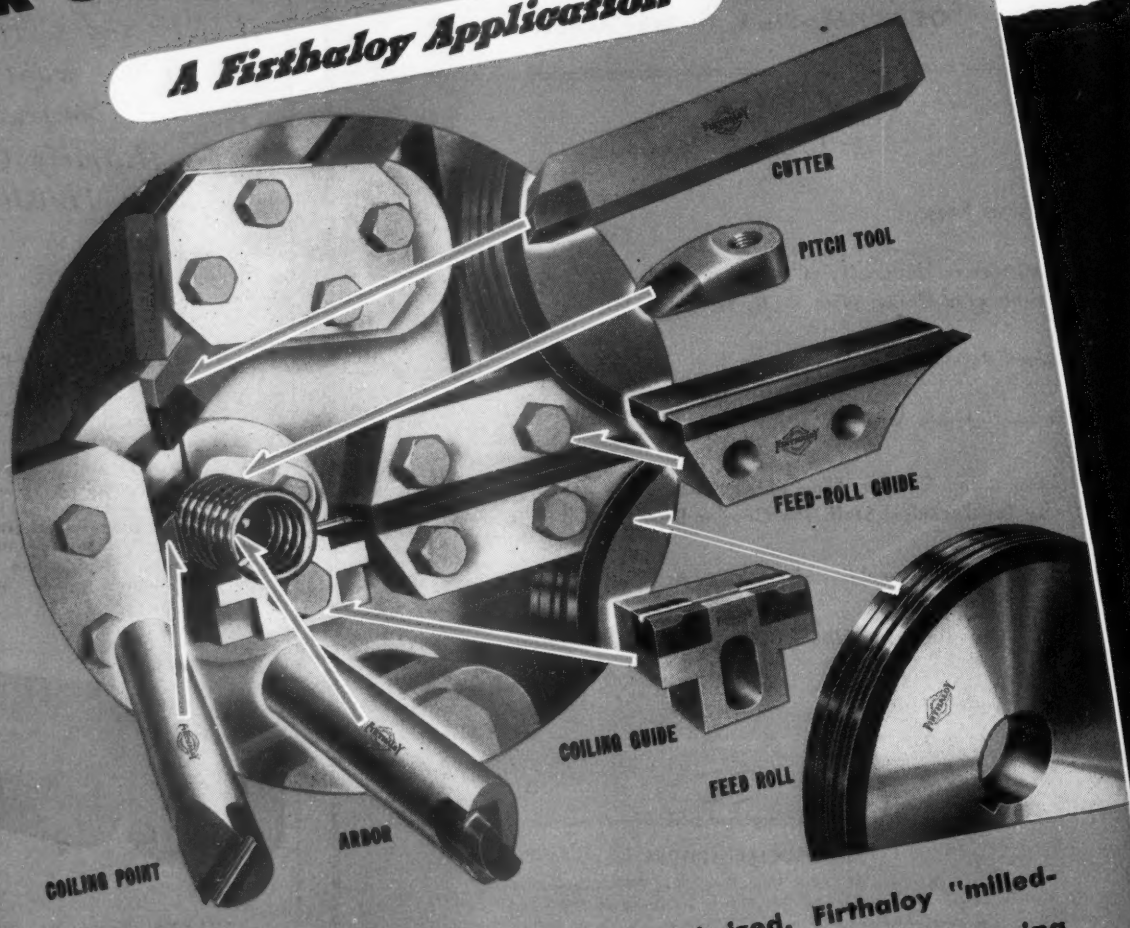

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Temperature Uniformity in Heat Treatment of Coiled Metal

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An address delivered before the Springfield Regional Meeting of the Wire Association at the Hotel Kimball, May 3rd, 1946.

FOR annealing and similar heat treating operations most of the strip and wire of steel, brass, copper, aluminum and other metals is heated and cooled in form of coils. Similarly, the greater part of the output of sheets of these metals is heated and cooled in form of batches or piles. In view of an ever increasing demand for more uniform metal products, it is desirable to investigate the actual degree of uniformity obtained in commercial practice when heating and cooling metal in such manner. Such investigation is desirable in order to demonstrate if these old and time honored methods are really adequate to meet present requirements for better metal products.

* * *

IN commercial heat treating practice it is usually desirable to produce uniform products. In many processes this is possible only if heating and cooling are uniform and provided the metal before heat treatment is of uniform structure.

Note: An exception is the process of quenching where a non-uniform rate of cooling is essential for success. The terms, "uniform heating", and "uniform cooling", are used rather loosely in technical literature and industry. (1)

THERMAL uniformity comprises three fundamental requirements which should be met at all points in the object to be heat treated:

(a) equal ultimate temperature in heating and cooling

(b) equal rate of heating and cooling

(c) equal time at any temperature above room temperature

* * *

ACTUALLY none of these three requirements can be met in practice because heat transfer from the source (hot gases, pot, muffle, resistor, combustion tubes, etc.) to the charge, or from the heated charge to the cooling medium can occur only if temperature differences prevail. High degree of thermal uniformity can be achieved by small temperature differences. On the other hand, roughly speaking, the furnace output is greater if the temperature differences are greater because of more rapid heat transfer. Thus, a workable compromise must be found in commercial practice between the desire for highest degree of uniformity of the product (requiring temperature differences as small as possible) and the desire for greatest output (requiring temperature differences as great as possible).

* * *

THE metallurgist or the person writing the heat treating specifications should, therefore, in every case know how far he is going in this compromise. Once he knows the actual degree of thermal uniformity achieved in the product, the metallurgist will eventually be able to tell him the degree of uniformity actually rquired in order to produce the

(1) "Elements of Industrial Heating", J. A. Doyle, 1922.

desired results. For certain simple shapes and for isotropic [2] (solid) metal, it is possible to calculate the extent to which the requirements for thermal uniformity have been achieved. Simple shapes, in this respect, are spheres or long cylinders and large slabs, both without end effect. The calculations must be based on certain simplifying assumptions but should still result in figures of practical significance.

* * *

UNFORTUNATELY, coils and piles of thin metal cannot be considered "solid" from the thermal viewpoint. This is illustrated by Fig. 1, representing a single coil of strip metal. Heat received radially, as indicated by arrow R, encounters a different thermal resistence from heat entering axially, as indicated by arrow A. In direction "R", consecutive layers of metal are interspersed with air spaces and only occasional contact between the layers occurs; in direction "A" the heat flow takes place entirely within the metal, each layer having approximately the same thickness and the same length, L, of the heat flow path. Similar conditions, of course, prevail in piles of sheet. In coils of rod or wire there is practically no direction, axial or radial, of heat flow entirely within the metal. Layers of wire alternate with air spaces, or, in case of fine wire wound on spools, with points of contact resistance. The wire or rod over its entire length in the coil, and comprising all layers, presents a continuous metallic path for heat flow. However, the length of this path is so great that uniform heating or cooling obviously cannot be achieved by relying on this flow; therefore heating across the air spaces which separate the layers is common practice.

* * *

IF but one coil of strip is being heated, and if all its surfaces are exposed to heat, then overheating of the outside layer is unavoidable. The word overheating is used here in a thermal sense only. Great temperature differences between outside and inside layers are unavoidable. However, such difference may in some cases still result in an acceptable structure of the metal. Similarly in cooling a too rapid drop of temperature of the outside layer is unavoidable. From Fig. 1, it is apparent that all layers heat or cool alike as far as heat flow in direction "A" is concerned. The outside layer receives or gives off, however, additional heat in direction "R". In commercial practice most of the strip metal heat treated in coils receives and gives off heat mainly in radial direction "R". This indicates a a limitation of thermal uniformity, as defined above, achievable in pot type, bell type and similar furnaces.

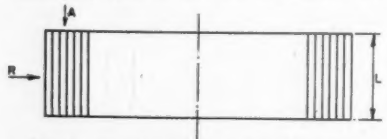

Fig. 1. Direction of heat flow in coil.

(2) "Isotropic" means that the properties in different geometric directions are the same. In this paper the term "solid" is used instead of the correct, but more abstract, term "isotropic".

* * *

FIG. 2 shows schematically such a charge in a round bell type furnace. Depending on the arrangement of resistors, combustion tubes (radiant tubes), or combustion chamber without such tubes, it is quite probable that the top coil (T) and the bottom coil (B) will receive more heat because of axial flow (A in Fig. 1) in addition to the radial flow (R in Fig. 1). Thus, obviously, a difference in thermal history exists between central and top or bottom coils, heated in such a furnace. Conditions can be improved, but not entirely remedied, by placing the bottom coil, B, on an elevated base and covering the top coil, T, by a plate, to retard axial flow to the plane faces of the coils. Frequently in heating small coils, several coils are put on the same level, so that a horizontal cross section shows a number of coils. The non-uniformity is then obviously still worse because not even the radial heat flow is uniform for any one coil, or equal for different coils.

* * *

THE following curves deal with the case of one coil only, on any level above the bottom of the cylindrical furnace chamber (as in a round bell or pot type furnace). From the viewpoint of radial heat this is the most favorable condition. Moreover, it is assumed that the unfavorable conditions referred to above are corrected; or, in other words, that top and bottom coils (Fig. 2, T and B) receive heat only in the same manner as the inbetween coils, namely, in radial direction "R" and no heat in axial direction "A". Such condition is much closer to the ideal than that of the usual commercial practice.

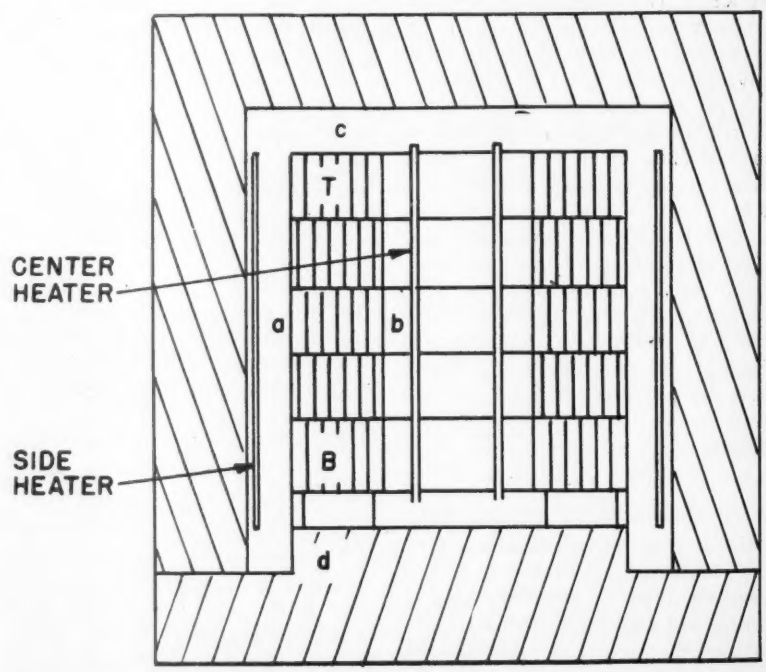

Fig. 2. Schematic arrangement of coils in furnace. Furnace equipped with side and center heater. Heaters may be resistors, radiant tubes or gas oil burners.

RADIAL heating of metal coils under such conditions involves the following: Heat is transferred radially to the outside layer of metal. From this layer only a small part travels in the metal by conduction to the next layer. The greater part is transmitted through the air space by radiation and conduction of the air. Radiation is relatively low at low temperatures and conduction through an air space small enough to prevent air circulation is also quite limited. Thus, there is an appreciable delay in heating the second layer. As the second layer increases in temperature it will transmit part of its heat to the third layer; but again there will be a lag, for the reason indicated. The heating of inside layers of the coil lags considerably behind that of the surface.

* * *

THE following investigations are based on the assumption of constant furnace temperature throughout the heating operation. In practice, the temperature of a batch type furnace drops on the insertion of a new charge; but in most cases this is a secondary consideration. If a constant furnace temperature is given it is not possible to specify both surface temperature and the temperature within the coil. For a desired surface temperature and a given furnace temperature, the temperature at the center of the mass [3] cannot be arbitrarily selected, or influenced by change of heating time, because there is a definite relationship between the temperature of surface, center and furnace. Therefore, a specification requiring heating and cooling material to and from a given temperature is incomplete. Rather surface and center temperature should be given. In some cases a furnace operates at temperatures only slightly above the desired surface temperature. It is possible to specify the furnace and center temperatures and thus determine the heating time. The surface temperature will then lie somewhere betwen the specified furnace temperature and center temperature.

IT is necessary to indicate a temperature range — maximum and minimum temperature of the charge. From this range the maximum furnace temperature and the minimum heating time can be calculated for a charge of given size, shape and material, exposed to uniform furnace temperatures on all or some of its surfaces. Thus, if the furnace temperature is established, the surface temperature equal to the maximum permissible charge temperature is attained within a certain time, at the end of which period the center of the charge has reached the minimum permissible charge temperature. If a higher center temperature is desired, then the charge must be retained for a longer time in the furnace; consequently, the surface temperature rises beyond the permissible maximum value. Thus the statement is corroborated that, for a given furnace temperature, only surface or center temperature of the charge can be specified — not both. If for a given furnace temperature the resulting temperature uniformity expressed by the difference betwen surface and center temperature is not acceptable, then the furnace temperature should be lowered. The uniformity will be improved, but of course the necessary heating time is increased. If, on the other hand, the temperature uniformity was better than necessary, then the furnace temperature

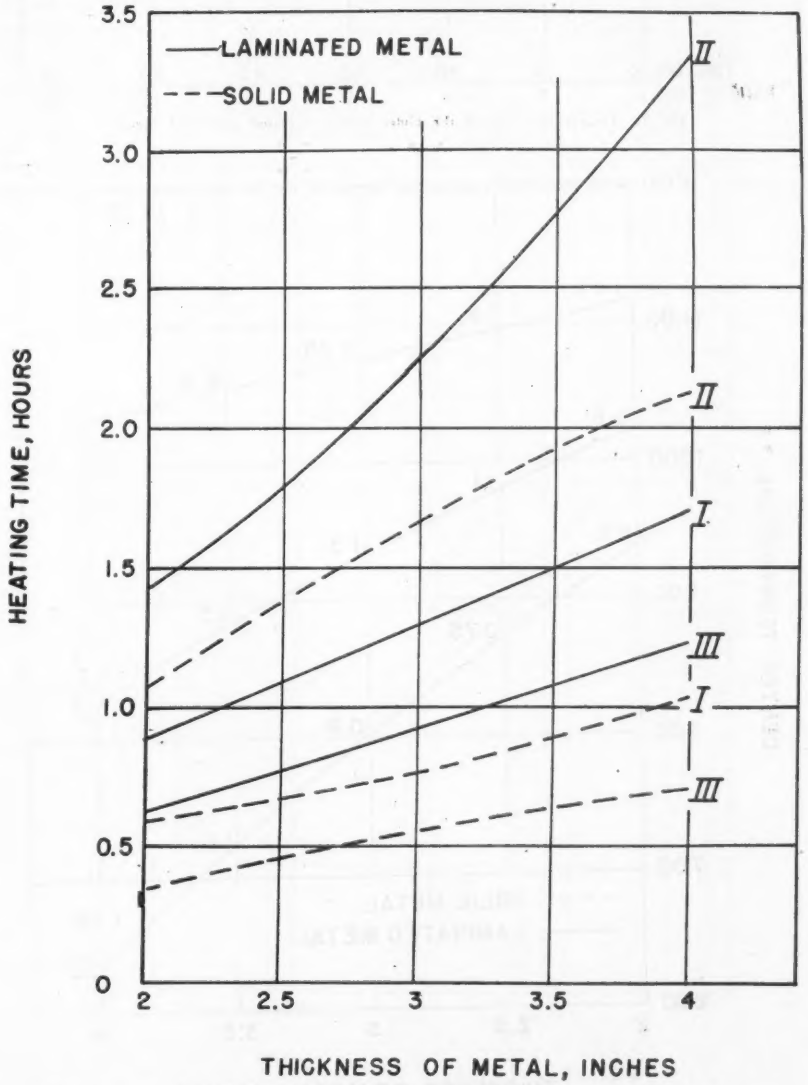

Fig. 3. Heating time of metal coils in furnaces I, II or III, necessary to reach a surface temperature of 1200 F., held constant at 1300 F.

(3) **In the following the term "center temperature" will be used to designate the temperature in the center of the mass (e.g. at a distance of 2" from the surface in case of a 4" Coil); it does not designate the temperature at radius zero.**

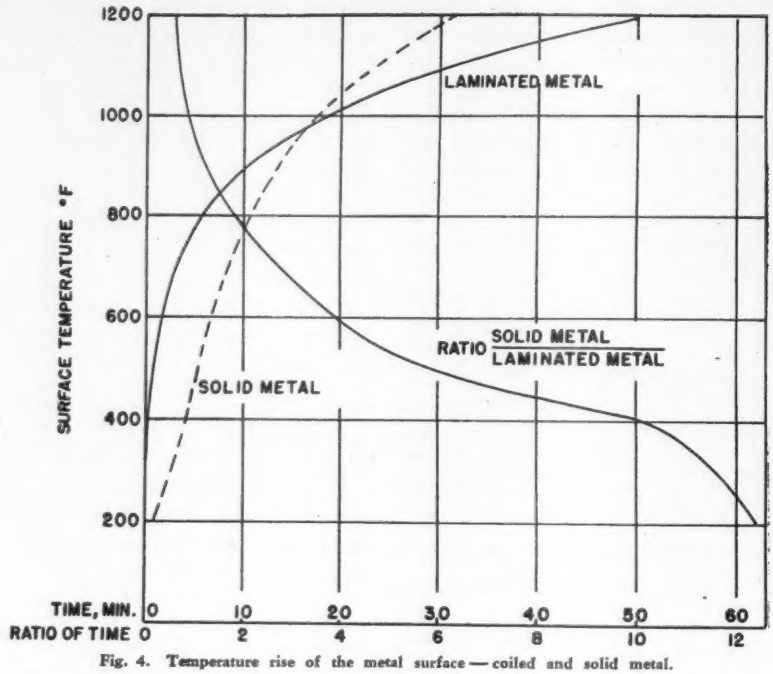

Fig. 4. Temperature rise of the metal surface — coiled and solid metal.

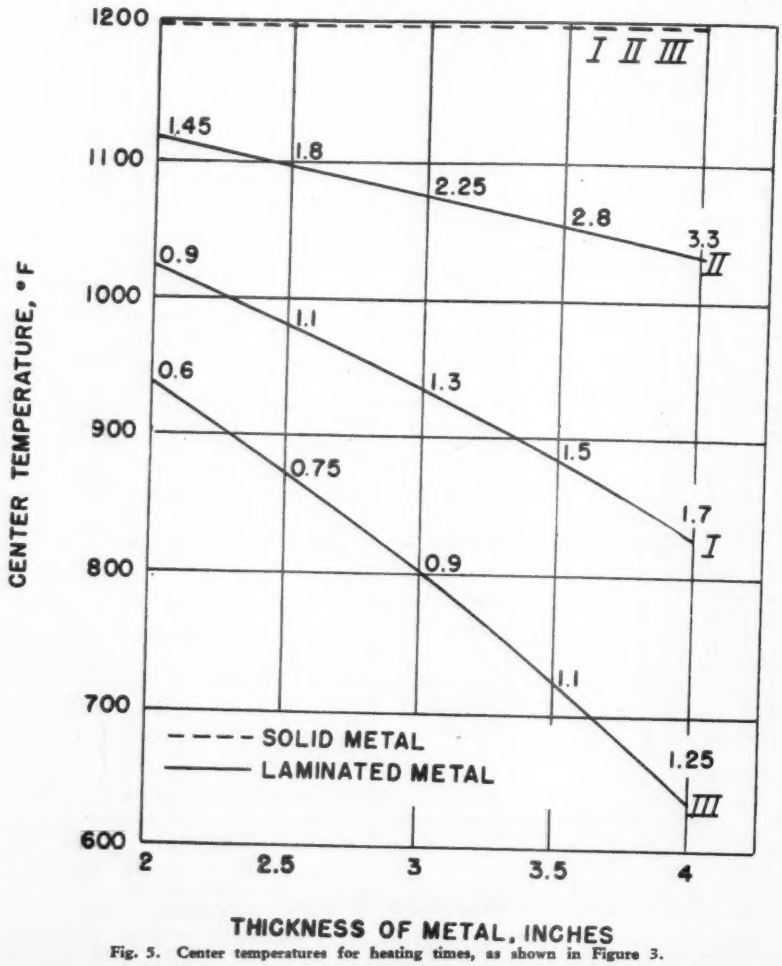

Fig. 5. Center temperatures for heating times, as shown in Figure 3.

can be raised and the heating time shortened.

* * *

IN the following examples the behavior of three different brass coils in three different types of furnace is investigated. [4] The coils are identified by their thickness, 2, 3 and 4 inches. These are nominal values, referring accurately to solid rings of the same weights. The coils are slightly thicker than solid brass rings of equal weight. In all three furnaces the end effect at top and bottom of the charge is not considered. Referring to Fig. 2, in the following paragraphs, coils B and T are considered as being shielded against axial heat flow. All coils receive heat radially only (R in Fig. 1).

* * *

THE three furnaces are characterized as "radiation furnace" (I), "convection furnace" (II) and "combined radiation and convection furnace" (III). Inasmuch as all investigations were carried out by calculation it is sufficient to say that (referring to Fig. 2) heat is transferred to surfaces a and b but not to c and d, by radiation, convection or both, respectively. The heat transfer to the surface can be characterized by the "heat transfer coefficient" (Btu per sq. ft., hr., F). Its values have been assumed to be 20.8, 10 and 30 Btu per sq. ft., hr., F., respectively for furnaces I. II and III. [5]

* * *

THE values for the "coiled" metal have been compared with values calculated for "solid" metal. The "solid" rings have the same weights respectively as the coils. Their behavior, however, is obviously quite different, because the air spaces which retard heat flow in the coiled metal do not exist in the solid metal.

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(4) Whereas the figures given here hold for brass, the general nature of the findings and the trend of the curves hold for any coiled metal, or pile of metal sheets, heated across the layers.

(5) The boundary conductance of 20.8 is based on an emissivity of the surface of 0.6, a furnace temperature of 1300 and a surface temperature of 1200. The boundary conductance of 10 holds for medium air velocities. The value 30 is obtained by superimposing heat transfer by convection to that by radiation.

RESULTS are given in Fig. 3-7. The investigations developed by calculations were based on a furnace temperature of 1300 F and a temperature of the coil surfaces of 1200 F. Fig. 3 shows the heating time (ordinate) plotted against thickness of the metal coil or ring (abscissa). The heating times indicated are necessary to raise the surface temperature to the desired value. Six curves are shown, three for "solid" metal and three for "coiled" metal. Each of the three curves in each group holds for a definite furnace. It may be noted that the heating times for "coiled" metal are considerably longer than those for "solid" metal. This may at first appear surprising. It would appear that if the conductivity of "coiled" is lower than that of "solid" metal, then the surface temperature should increase more rapidly in coiled metal, because heat cannot flow as readily toward the inside. But this is not the case.

* * *

THE following explanation may serve to demonstrate that, contrary to this first impression, the data presented in Fig. 3, are correct. At low temperatures, i.e., at the beginning of the heating process, the "coiled" metal actually does heat faster. But as the temperature of the surface increases the amount of heat that can be transferred to the surface decreases. For example, the amount of heat transferred from the furnace, held at a constant temperature of 1300 F, to a surface at 200 F, is twice as great as the amount of heat which can be transferred to a surface at 750F. Inasmuch as the surface of the coil heats more rapidly, the heat flow to the metal decreases faster in case of the "coiled" metal, because of the rapidly decreasing difference between the constant furnace temperature and the surface temperature. The result is that the surface temperature of the latter increases rapidly and faster than that of "solid" metal up to a certain point. Beyond that point the temperature of the outside layer of the coil increases more slowly than the surface of the "solid metal".

* * *

FIG. 4 shows two curves, one for the temperature increase of the surface for coiled and one for solid brass. The third curve in this figure shows the ratio of heating time plotted against the surface temperature. It may be seen that the surface reaches a temperature of approximately 975 F for both the solid and coiled metal in the same time. For lower temperatures, the coiled brass heats faster, for higher temperatures the "solid metal" heats faster.

* * *

THE question may arise, what center temperatures are reached within the heating times shown in Fig. 3? This is answered by Fig 5, which shows the center temperatures plotted against thickness of the metal. There are again six curves, corresponding to the six in Fig. 3. On the curves the heating times, as reported in Fig. 3, are noted in parenthesis: e.g., for a 4″ thickness, furnace II, the heating time is 3.3 hrs., and the center temperature 1030 F. From the curves it may be seen that the center of the solid metal has practically reached the same temperature as the surface. The greatest difference within the "solid" metal is three degrees F (4 in. thickness; Furnace III). In the case of coiled metal, the center of the mass lags much behind the surface, and, particularly in case of relatively great thickness, the differences are altogether too great for practical purposes (562 degrees for 4 in. thickness; Furnace III).

* * *

AS stated previously, this condition cannot be corrected by leaving the metal in the furnace for a longer time. The result of such a procedure would be that the surface temperature increases, which, as per assumption, is not permissible. The only remedy is to decrease the furnace temperature and to increase the heating time.

* * *

ANOTHER example relates to a case in which the temperature at the center of the coil at the end of the heating time should be within 5% of the surface temperature. If the surface temperature is unchang-

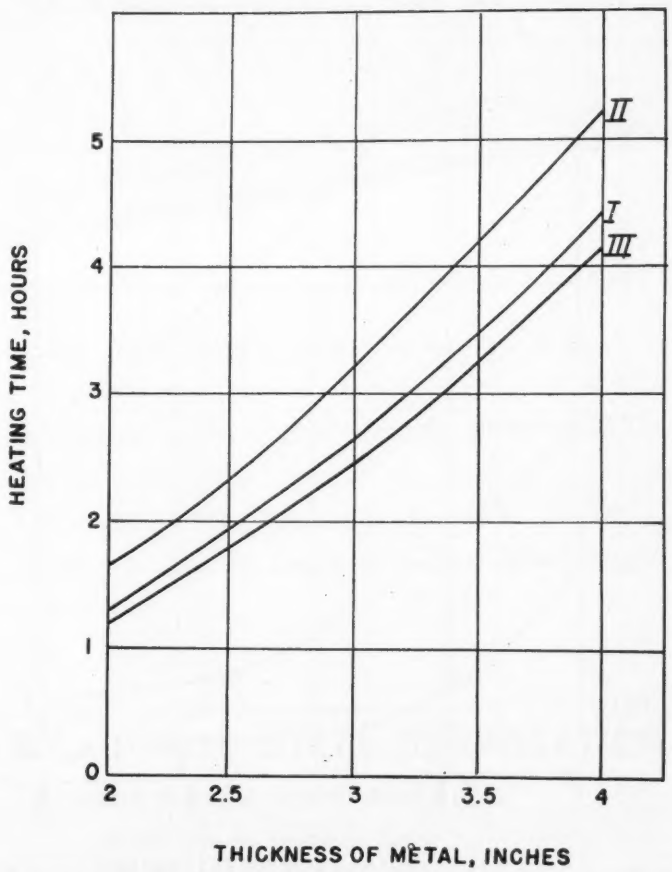

Fig. 6. Heating time to reach a surface temperature of 1200 F. and a center temperature of 1140 F. (Brass coils).

ed 1200 F, the center temperature would be 1200 — (5/100) X 1200 = 1140 F.

* * *

AS explained above, only one furnace temperature and one value of heating time can produce this result for a specific furnace and a given thickness of the coil; the figures for these constant furnace temperatures and heating times are shown below.

* * *

WITH "solid" metal, such a substantial difference between surface and center temperature would obtain only if the furnace temperatures were exceedingly high. The calculated value of the furnace temperature of solid brass would be 3000 F and above, and the heating times would be extremely low. Such high furnace temperatures are, of course, impractical; moreover, they would cause a heat transfer coefficient far beyond the one applied to the lower furnace temperatures that are considered so far. This would further increase the theoretical furnace temperature and lower the heating time. A much lower furnace temperature could be applied, and a higher degree of uniformity would be obtained in somewhat longer time, than the very few minutes calculated for 1140 F center temperature.

* * *

CONDITIONS are entirely different for the coiled metal. Curves for brass coils are plotted in Fig. 6 and Fig. 7. Fig 6 shows the necessary heating times and Fig. 7 the necessary furnace temperatures for definite thickness of coiled metal, both for a center temperature of 1140 F. It may be seen that the heating time is between 1.5 times and 3.5 times as great as those shown in Fig. 3, for the lower center temperature presented in Fig. 4.

* * *

IT is apparent that even if time is taken to heat the metal coils to a reasonable degree of uniformity (1200 F at surface and 1140 F at center) other difficulties will arise. The surface heats much faster than the center; consequently, the rate of heating of the surface is different from that of the center. Moreover, the surface is exposed to relatively high temperature for a very much longer time than the center. Thus, two of the three requirements for uniformity mentioned previously are not fulfilled, even if the heating time is extended long enough to obtain fairly uniform temperatures at the surface and the center. Therefore, a uniform metal product should not be expected even if the final temperature uniformity is acceptable — particularly so if time at temperature and rate of heating influence the crystal structure.

* * *

IT is well to remember that the form of energy releasing the heat — electricity, gas, oil, etc. — can at best only influence local temperature uniformity in the furnace chamber. But, even in case of local uniformity of furnace temperatures, the thermal uniformity of the charge may be far from satisfactory and only this latter uniformity decides the quality of the product. It is a mistake to assume that either electricity, or any type of fuel is preferable as a method of obtaining uniform material. The prime emphasis is to be put on the correct method of heat transfer which should avoid heat flow across the air spaces separating the layers of a coil or the sheets in a pile. Only after this has been done does the temperature uniformity of furnace space which may be influenced by furnace design and selection of energy form enter the picture.

* * *

PRACTICAL conclusions from these findings are significant to those

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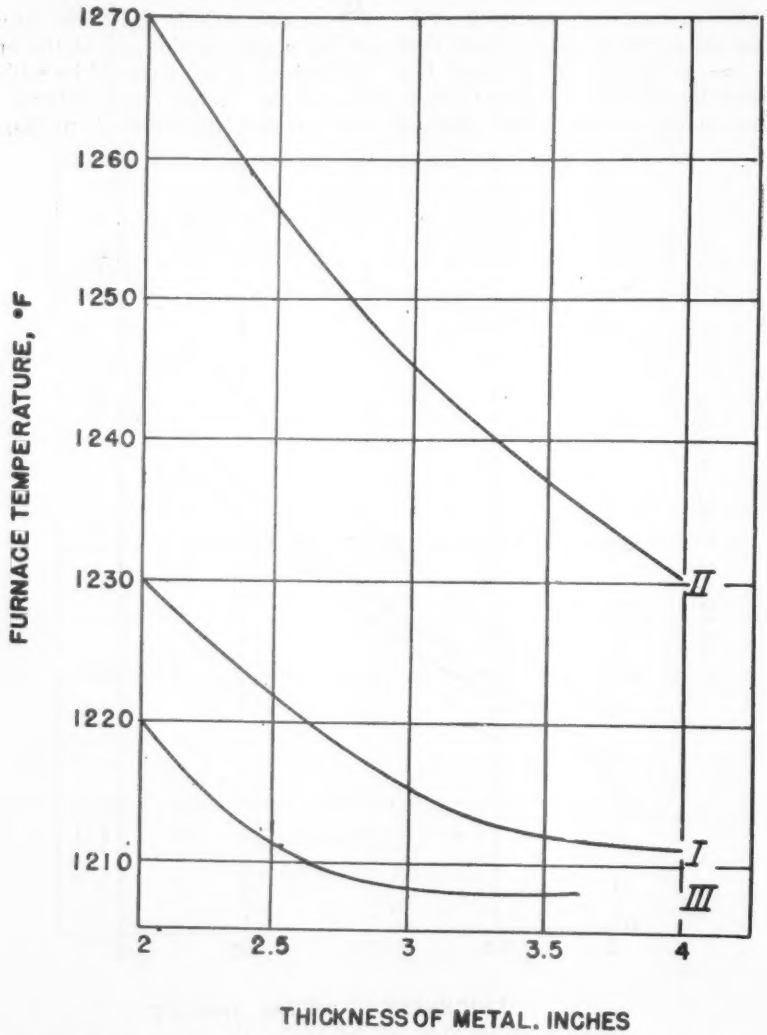

Fig. 7. Furnace temperatures to achieve heating times shown in Fig. 6.

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LABOR RELATIONS

By Hector Lazo
Director of Public Relations
Loose Wiles Biscuit Company
New York, New York

An address delivered before the Annual Meeting of the Directors' of the Wire Association at the Waldorf-Astoria Hotel, New York, New York, March 29th, 1946. Mr. Lazo appeared through the courtesy of the National Association of Manufacturers.

IN accepting the invitation of your Secretary, transmitted to me through the office of the **National Association of Manufacturers**, to speak informally with you on this very important topic of Labor Relations, I do so fully cognizant of the fact that I am not a professional Labor Relations man, and that I neither do nor can lay any claim to being an expert on the subject. I trust that all of you will bear this in mind, for I lay no claim to having a technical knowledge of the many intricacies involved.

* * *

THE time has come, however, when we in business must recognize that personnel administration has become the primary task of top management in business. More and more, the situation has developed to a point where in a growing number of cases, the head of the personnel administration reports directly to the president of the company. In many instances, the Director of Industrial Relations is a vice president of the company. In practically all instances, the importance of personnel administration has been recognized and has been lifted from its previous more or less junior executive post to that of the top executives of the company.

* * *

OBVIOUSLY, each company develops its own system of personnel administration as it does with any other major departmentalized activity. In other words, your own personnel administration must be a tailor-made department for your particular company or organization. However, personnel administration has become a top staff function on a par, in the corporate structure, with the operating and other major staff divisions of the company, such as manufacturing, sales, finance, engineering and research, both marketing and product research.

* * *

IT would be presumptuous on my part, or on the part of anyone else, with as little knowledge of your industry as I have, to even attempt to set up a pattern of organization for personnel administration for your type of operation. Furthermore, there are many splendid professional suggestions and patterns available. And, quite frankly, I come back to my original opening remark that I am not a professional personnel administration organizer. My concern is with the philosophy and the policies which guide such departments, and it is there where I feel that we, in management, must take a very good, a very objective, but a very thorough second look at ourselves today.

HECTOR LAZO

DIRECTOR OF PUBLIC RELATIONS
LOOSE WILES BISCUIT COMPANY
NEW YORK — NEW YORK

graduated with high honors from Harvard and New York University School of Business Administration and served in the Marine Corps, in World War I. Was Commercial Advisor to the Governor of Puerto Rico and was Assistant Chairman of the National Foundation Code Authority in NRA., has written extensively on Marketing Procedures and directed his Company's Veterans policy on re-employment since May 1944.

* * *

FIRST of all, let us all agree among ourselves that what we are talking about are the **human relations in an organization**; that is, the utilization of the human assets of a business to the mutual advantage of the employee and of the enterprise. And here we must naturally place emphasis upon the importance of seeing to it that the individual achieves personal satisfaction through his work, and also that the employees are given recognition as individuals, rather than as groups.

* * *

I AM of the firm conviction that one of the reasons we have the situation today in our national labor picture is because in the past generation, the tremendous demand upon top management business executives to get out the production, and then, during the depression, to keep the plants going without going too far into the red, has, of necessity, resulted in a top-heavy emphasis on production and production costs, with consequent somewhat neglected human relations in many organizations. This is, obviously, not as true of the small, well-knit, coordinated unit; but the bigger the organization, the greater the danger of this coming to pass.

IN evolving a policy which will meet our present and our future needs, we must, of course, bear in mind that so-called big business — that is, the integrated type of business organization — is really something of the last 50 or 60 years. Prior to that, there was no such thing as **big** business. Our really big giants in industry were developed only at the turn of the Century, and during the 20th Century. The problems are therefore modern problems; they are 20th Century problems; and we can't either solve them, or do very much about finding suggestions for solving them by going back into past history and telling ourselves how lovely it was in the "good old days".

* * *

MY point is that we must squarely face the problem as it has developed in the 20th Century, and particularly as it has developed since the First World War. It is at this level — at this level of 1946, 1947, 1948 and 1950 — that we must pitch our policies and set our sights. Because if we don't, both nationally as a country, and individually as important units of the productive system, we stand in dire danger of losing what we choose to call the American way of life, which is the **private capitalistic system of doing business** or, more popularly, the **private enterprise system.**

* * *

SINCE the end of the war, we have been deluged with all kinds of proposals, and claims, and counterclaims, and it is no wonder that the whole nation is confused. Certainly, we must be charitable, at least in admitting that all of us are confused, so that we can give an excuse for the government officials in Washington who are so completely confused with this whole subject that they are unable to evolve any kind of a policy. But we businessmen must do something more than just simply criticize and find fault. We are faced with several proposals which have the power of national recognition behind them, and we have to do something about them. For example, we are told that profit-sharing is a cure-all for all the employee unrest. It sounds good. It makes a very good slogan for politicians and demagogues. It undoubtedly will make a fine slogan for labor unions. But we must bear in mind, and inescapably, that before we can have any profit-sharing, there must first be profits. It's like the old saying in New England that in order to have rabbit pie supper, first get your rabbit. Not only must there be profits, but there must be, in any profit-sharing scheme, a sufficiently large sum to make for employee satisfaction. But just profit-sharing alone is not going to turn the trick, unless we also have a very sound industrial relations program along with it.

* * *

WITH the growing labor unrest and labor dissatisfaction, many companies that used to have profit-sharing program have discontinued them. Companies and employees alike have found that employee confidence in management and harmonious employer-employee relations are **the absolute basic foundations on which the successful administration of a profit-sharing plan, or any other plan, is built.**

* * *

BUT we are faced also with a lot of other catch phrases. For example, "free collective bargaining". Another one is "maintenance of membership". Still a third is "labor - management committees". One of the most pernicious and one of the least thought-through is "ability to pay".

* * *

WE are no longer in a postion of simply opposing these panaceas and of denouncing them as unsound. We have got to show how they are unsound and, not only that, we have to come forward with a program of our own, which will make for sound employer-employee relations. It is at that level that I hope to make a contribution to you today.

* * *

NOW let us clear away a few cobwebs before we have a concrete proposal. Let us bear in mind that we are fundamentally faced with a condition in which there is fear of insecurity, both in the minds of labor and in the minds of management. Never before have the men at the helm of industry needed so steady a hand as they do today. Never before has management needed so much of what Professor Selekman at Harvard calls "emotional maturity". A part of this "emotional maturity" on the part of management is both a desire and an ability to sit down with Government officials, however many number of times it may be necessary, to guide Government officials in the establishment of a sound, sensible and fair national policy. To make charges and to accuse Government officials of being confused beetles in this picture is not going to solve the problem.

* * *

WE must be willing to sacrifice ourselves and to sacrifice our time and effort, however many number of times it may be necessary, in order to evolve a fair and equitable national labor program. That is the first "must'. We are not going to have management-labor peace in this country until we have a fair national policy. By fair, I mean one that is fair to all elements involved. Above all, we must not forget that there are there primary elements; (1) is labor; (2) is management, or the companies that employ them; (3) **is the national public interest.** The people at large in this country are the biggest stockholders in the world, stockholders in the U. S. A., and they are the ones who are entitled to preferred consideration in anything that is evolved in the field of social or political economics.

* * *

NOW, as **Professor Selekman** explains it, an emotionally mature person is one who accepts unpleasant facts as concrete situations to be handled, rather than be hated. So let us not personalize the developments that are distasteful to us, and let us not try to ascribe the responsibility to individuals who can then be blamed and fought, and punished. We all in this room know that the men with whom we deal from day to day often prove hard-hitting and gritty at best, and unreasonable and unfair sometimes. It is up to us to rise above that level and, **as managers,** show and prove our maturity.

* * *

MUCH as management is perturbed by the many factors which have entered into this picture, and much as management has a right to some of these feelings, we must

There's No Substitute

Given the inherent productivity and long life of cemented carbide dies, there's still one vital feature that completes the picture—and that's service. When your wire, bar or tubing dies are Carboloy* you get two things: quality dies, plus complete Die Service.

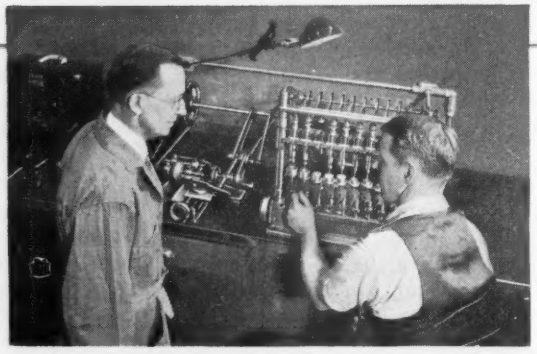
This is the six-point program, set up by Carboloy, to help get dies in production faster—keep them there longer—make their re-conditioning a simpler operation. There's no substitute anywhere for this kind of service.

1 LOCAL STANDARD STOCKS

Carboloy Die Service anticipates your order for Standard Round or Shape Dies by maintenance of local stocks in Detroit, Los Angeles, Chicago, Pittsburgh and Thomaston, Connecticut—provides fast delivery in metal working areas, coast-to-coast.

2 SERVICE CENTERS

When you need help for servicing or finishing dies, Service Centers—with complete die finishing equipment—are maintained at four central points: Detroit, Chicago, Pittsburgh, Thomaston. These Service Centers, manned by Carboloy Die Specialists, are available to you for fast, expert work.



3 FIELD ENGINEERS

Carboloy Die Sales Engineers are experienced specialists, trained to analyze all your die needs, from problems of application and maintenance to die room organization. You'll find Carboloy Engineers ready with practical suggestions that bring results.

DRAWING • FORMING • BLANKING • DEEP DRAWING • CUPPING • SIZING • EXTRUDING

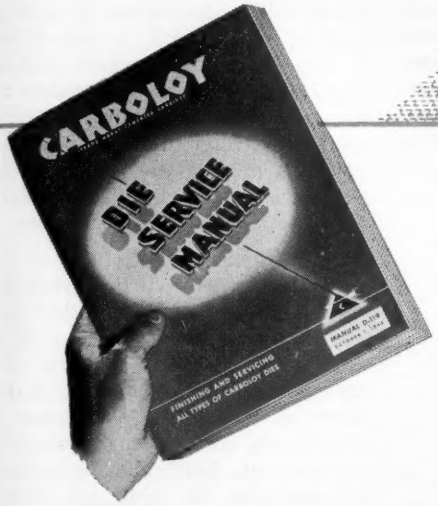
*CARBOLOY

(TRADEMARK) CEMENTED CARBIDE

FOR SERVICE

4 FACTORY DIE SCHOOL

Carboloy's FREE Die School in Detroit provides for your die-room personnel a coordinated program of lectures, demonstrations and actual die room work, covering basic training in carbide die application and maintenance. Here's training equally valuable to new men, or as a refresher course for the more experienced.

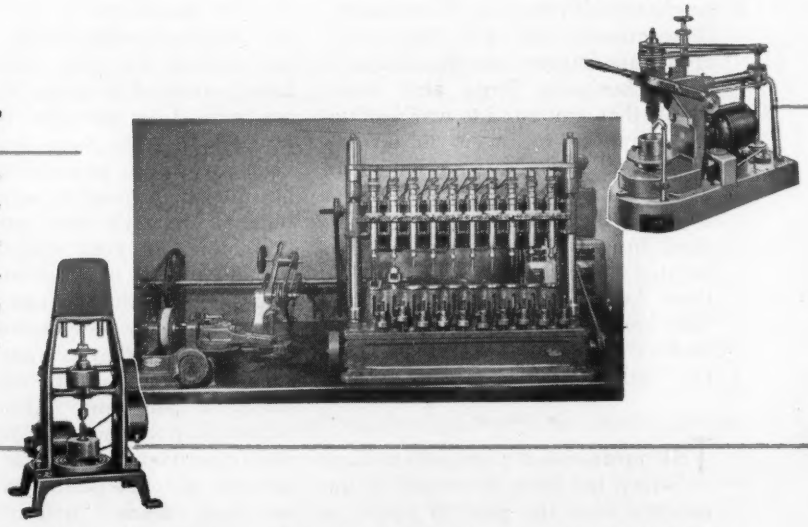


5 DIE SERVICE MANUAL

The latest and best "handbook" on die finishing and maintenance is Carboloy's comprehensive Die Service Manual—a well-illustrated 64 page book, packed from cover to cover with the facts you want to know on fast, economical die-room practice.

6 DIE ROOM EQUIPMENT

Finally, the die finishing and servicing equipment manufactured or recommended by Carboloy is your best assurance of an efficiently operating die-room. With this equipment and adequately trained personnel you get fast finishing of dies in your own mill.



COMPLETE DIE SERVICE FOR WIRE, BAR, TUBING AND SHEET METAL

CARBOLOY COMPANY, INC., 11171 E. 8 Mile Blvd., Detroit, 32, Michigan

Chicago • Cleveland • Detroit • Houston • Los Angeles • Milwaukee • Newark • Philadelphia • Pittsburgh • Thomaston, Conn.

Authorized Distributors: Hartley Wire Die Co., Thomaston, Conn. • Michigan Wire Die Co., Detroit, Michigan

not for one moment overlook the fact that the memories of the depression experienced remain very vivid in the heart of most Americans, and that the question that the workingman is asking, above all else, is "will I have a job next month"? Along with this question comes the question of whether or not they can remain in the community or the home which they have been purchasing or living in for the past several years. That means also the school for the children. It means friends and friendships which are broken up. It means all the host of human relationships which are built up around the community. It means also the situation faced by a home where the combined family income has been swollen by wartime earnings to perhaps the category of $2,500 to $3,500 a year, and now is in danger apparently, of sinking down to $1,500 to $2,000 a year. It means to them a reduction — a drastic reduction — of the standards of their living. And, naturally, and following all the patterns of psychology since that science was first discovered, any thread of deprivation unloosens aggressiveness. It evokes anger; bitter emotions; frustrated individuals are propelled to resistance best adapted to their resources in the situation; hence, they strike.

* * *

NOW, management also has some anxieties. The union organizer, since the 1930's, has gotten his foot into the manager's office of every single establishment in this country. Government, too, has thrust encrouching fingers into the affairs of every business, large and small. Plants that converted to war production have to reconvert to civilian production, and the Government, in many instances, has not only not favored their accumulating sufficient funds to do it with, but has pointed out such accumulations, as there have been, in the worst possible light to the public, so that labor leaders and labor agitators could cry "unholy, hidden profits".

* * *

THE professional management class, which has been developed in this country over the past 75 years, as of necessity, the owners tended to be more and more separated from the workers in the plant, has seen in every encroachment on the part of labor, and every encroachment on the part of Government, as a diminishing of the management prerogatives. Management is naturally anxious. There is a threat to management's job and to management's position. Management also reacts in the same way in which employees have reacted, and this emotional fear that is aroused evokes anger. It also evokes the same forms of human response through action. But over and over again, management has found that we cannot run away from these problems, but that we have to face them. And we cannot face them by destroying unions, or by fighting at the level of hatred and blind opposition.

* * *

COLLECTIVE bargaining is the law of the land and, by and large, I believe that most businessmen believe that it's a good thing. Whether we do or we don't, we have to live with it, and our job is to find the best possible means of living with it, and not of obstructing its possible good effects.

* * *

ALL over the world, and America has been no exception, the social equation of labor has received more and more popular assent. National sentiments have changed. Many misunderstandings have arisen, and the public at large is so confused that in a recent national poll, they thought manufacturers had made 30 per cent net profit during the war, but agreed that they should have been permitted to make 10 per cent net profit. I am sure that the majority of us in his room would have been very happy to make 10 per cent net during the war, or at any other time. I haven't seen any recent breakdown of your industry as to the net profits made currently, but I assure you that in our industry, there are very few manufacturers who are making even 5 per cent net, and the vast majority are making under 4 per cent. Although the American public was willing to agree that manufacturers should make 10 per cent net; the public thought that we had made "unholy profits" during the war!

NOW we could go on and on, Gentlemen, and talk and talk, and bring us nowhere. I want to give you a 7-point program for labor relations, which will at least give you that this will solve all the prob- I am not conceited enough to say to you that this will solve all the problems any more than any of the many other proposals being advanced. But I think that you can at least put this down as a foundation stone upon which you can build your own individual policy, and if we have enough **individual** labor situations being equitably adjusted, we must, of necessity, have a composite picture which is a happier one than the one we have today.

* * *

SO I give you the following 7 plan-spoken points:

(1) We must have courage enough to establish a national labor policy, which will be guided not by political considerations, nor by considerations of expediency, but which will be based upon the national public interest. This requires courage, and it requires wisdom, but it is not too much to ask by the people of the United States that their Government show both courage and wisdom.

* * *

(2) We must curb monopolies wherever they arise, whether they are in business, or in labor, or in any other form of activity. The reason we, in this country, do not want big centralized government is because big government is monopoly government. Monopoly big business or monopoly big labor are equally anti-social.

* * *

(3) Contract responsibility must be mutual, and must be binding upon all parties to the contract. There are THREE parties to any labor contract: (1) the workers of the plant; (2) the management representing the owners of the plant; (3) the public of the United States. No contract should be permitted to be made, and no contract should be permitted to be violated, without the interest of all three parties being respected and protected.

* * *

(4) It is time that we face the truth in this issue of fact-finding and

(*Please turn to page* 409)

HUSSEY HEADS WIRE ASSOCIATION

WIRE ASSOCIATION DIRECTORS ELECT OFFICERS FOR 1946

Details of decisions reached by Directors at Annual Meeting in New York, March 29, 1946.

AT the Annual Meeting of the Board of Directors of The Wire Association held at the Waldorf-Astoria Hotel, New York, N. Y., March 29th, 1946, the following officers were elected for the 1946-47 term:

PRESIDENT—R. M. Hussey, Superintendent, Wire Department, Jones & Laughlin Steel Corporation, Aliquippa, Pa.

VICE-PRESIDENT, FERROUS DIVISION—N. C. Harrison, Vice-President, Atlantic Steel Company, Atlanta, Ga.

VICE-PRESIDENT, NON-FERROUS DIVISION—H. B. Carnahan, Assistant Works Manager, Canada Wire & Cable Company, Ltd., and Standard Underground Cable Company of Canada, Ltd., Toronto, Ontario, Canada.

EXECUTIVE SECRETARY—Richard E. Brown, Publisher "WIRE AND WIRE PRODUCTS", Stamford, Conn.

* * *

THE following new Directors were seated at this meeting: **Fred M. Crapo,** President, Indiana Steel & Wire Company, Muncie, Indiana; **Dr. S. A. Braley,** Senior Fellow, Mellon Institute of Industrial Research, Pittsburgh, Pa., and **Hugh B. Carnahan,** Assistant Works Manager, Canada Wire & Cable Company, Ltd., and Standard Underground Cable Company of Canada, Ltd., Toronto, Ontario, Canada.

* * *

THE following Directors retired at this meeting: **E. W. Gundstrom,** Assistant Plant Manager, Rome Cable Corp., Rome, New York; **B. L. McCarthy**, Director of Research, Wickwire Spencer Steel, Buffalo, New York; **W. H. Crawford,** Resident Manager, Eaton Manufacturing Company, Reliance Spring Washer Division, Massillon, Ohio.

* * *

THE following Directors were reelected: **John C. Callaghan,** Works Manager, Canada Works, Steel Company of Canada, Ltd., Hamilton, Ontario, Canada; and **Richard E. Brown,** Publisher, "WIRE AND WIRE PRODUCTS", Stamford, Connecticut.

* * *

THE report of the Executive Secretary showed a Membership of 630 as of March 1st, 1946, with a balance on hand in the Treasury of $453.09.

* * *

1946 Convention Plans

IT was originally planned to go to Toronto on invitation received from the Toronto Convention Bureau, but due to restrictions on hotel accommodations it was found impossible to make the necessary arrangements.

* * *

THE Directors, therefore, selected Buffalo, New York, with headquarters at the Hotel Statler for the week of October 21st as the place and time for the 1946 Convention.

* * *

Regional Meetings

THE New England Regional Meeting will be held at Springfield, Massachusetts on Friday, May 3rd, 1946, with headquarters at the Hotel Kimball.

* * *

THE Chairman of the meeting will be **J. G. McGreevy**, Vice-President Apco Mossberg Company, Attleboro, Massachusetts, and the paper will be entitled "Temperature Uniformity in Heat Treatment of Coiled Metal", the authors being **J. A. Doyle**, Vice-President, W. S. Rockwell Company, New York, and **Dr. Victor Paschkis**, Research Associate, Heat Transfer Laboratory, Columbia University, New York.

IN this connection, this paper presents an almost revolutionary practice in heat treating and should create great interest in the subject. Technical questions will be answered from the floor by Professor Paschkis.

* * *

THE meeting is being held at Springfield instead of at Worcester as heretofore, primarily because of the inability of any hotel at Worcester to handle it satisfactorily this year.

* * *

THE Pacific Coast Regional Meeting will be held at the Sir Francis Drake Hotel on Friday, June 7th, 1946.

* * *

THE topic of the meeting will be "Inhibitors" and the speaker will be **Wallace G. Imhoff,** President, Wallace G. Imhoff Company, Consultants in Galvanizing of Los Angeles, California.

* * *

IN addition to the paper there will be a sound motion picture on the topic of "Swaging". This picture is presented through the courtesy of the Standard Machinery Company of Providence, Rhode Island.

* * *

BOTH meetings will be dinner meetings with the registration fee fixed for each at $4.00. The fee includes the dinner cost.

* * *

Section Organizations

THE Board approved a suggestion that members interested in forming sections devoted to particular subjects should, if they desire, be authorized to form such sections within the frame work of the organization for the purpose of discussing identical production problems.

(*Please turn to page* 410)

Copper And Copper Alloy Springs

PART II — MANUFACTURE OF SPRINGS

By The Technical Staff of The Copper Development Association,

London, England

Springs made from Flat Strip

FLAT strip required for springs is usually rolled to what is known as "spring-hard" temper, in which condition it is not possible to do much work on the material without causing overstrain and cracking. Springs may be sawn, sheared or blanked-out to shape quite satisfactorily, but bending is seldom possible without risk of fracture. For this reason if a spring is required in any other than a flat form — and this is very often the case (see frontispiece) — the metal must either as a whole be of appreciably less than the maximum hardness, or local annealing treatment must be given where the bending is to take place, or the spring must be precipitation hardened by heat treatment after forming. The disadvantage of using material at less than the maximum possible hardness is that the maximum deflection which the spring can take without permanent set is reduced. Thus in the case of cold-rolled copper strip an increase of percentage elongation (a measure of ductility) from 5% to 25% reduces the 0.1% proof stress by 40%. Similar figures apply to brass and other copper alloys. The disadvantages of local annealing are that with a small spring it is impracticable and with larger ones it is difficult to restrict the annealing to just that portion required. Since the commoner copper alloys such as phosphor-bronze, nickel-silver, etc., can only be hardened by cold working it is generally impossible to restore the hardness to a softened portion of a spring.

FOREWORD

The design of springs calls for a precise knowledge of the physical characteristics of a material and of the theory of spring behaviour, as well as an accurately controlled fabricating technique.

* * *

As a general rule books and articles on springs deal principally with steel springs, but there are many cases where a non-ferrous spring, and particularly a copper alloy spring, has outstanding advantages.

* * *

Some of the knowledge required for the satisfactory design and production of springs has hitherto not been readily available in a convenient form, and it is the object of the publication of these data to provide information on the use of copper alloys which it is hoped designers and users of springs will find useful.

THERE are, however, alloys of copper, notably beryllium-copper, which can be hardened by heat treatment. Such materials can be formed in the soft condition to any desired shape and then subsequently hardened by a low-temperature heat treatment such as two hours at 300° C. This sort of treatment, which is not very critical, is well within the capacity of the normal works and is no more difficult than many hardening operations regularly carried out on steel. The precise tempering treatments recommended by one manufacturer are as follows:

From annealed condition	**2 hours at 310°C. to 320° C.**
From quarter-hard or half-hard condition	**1½ hours at 300° C. to 310° C.**
From hard-rolled condition	**1 hour at 300° C. to 310° C.**

* * *

OTHER manufacturers give slightly different treatment from these. If intermediate annealing is necessary in the course of manufacture of the spring this may be effected by heating to 800° C. and holding at that temperature for 20 to 30 minutes and then quenching quickly in water.

* * *

OTHER copper alloys which may be used for springs and which are capable of hardening by heat treatment — or precipitation hardening as it is called, are those of certain ranges of composition in the following series: — Copper-chromium, copper - cobalt, copper-zirconium, copper - cobalt - silicon, copper - nickel - silicon, copper - cobalt - beryllium, copper - nickel - aluminium, copper - nickel - phosphorus, and many others including complex brasses (such as "Kunial" brass*) and "K-monel". A further and most important feature of these alloys is that they may sub-

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Published in Four Parts —
Part I Design Of Springs
Part II Manufacture of Springs
Part III Characteristics of Spring Materials
Part IV Behaviour of Springs

* A copper-nickel-aluminium-zinc alloy.

Table 2. BENDING OF BRASS STRIP AT RIGHT ANGLES

Percentage Reduction. Tensile Strength	Thickness Inches	Hardness Brinell	Hardness Rockwell "B"	Minimum Suitable Radius of Bend. Inches: Bend at 90° to Direction of Rolling	Bend at 45° to Direction of Rolling	Bend Parallel to Direction of Rolling
64·5%–67·5% Copper; Remainder Zinc						
29·4%	0·0050–0·0508	119–150	67–80	S	S	1/64
	0·0571	125–150	70–80	S	S	1/32
27·2–31·7	0·0641	125–150	70–80	1/64	1/32	3/32
tons/sq. in.	0·0907					
	0·0050–0·0253	137–159	75–83	S	S	S
37·1%	0·0320	137–159	75–83	S	S	1/64
	0·0403	144–165	78–85	S	S	1/32
30·3–34·8	0·0453	144–165	78–85	S	1/64	1/16
tons/sq. in.	0·0508	144–165	78–85	S	1/64	3/32
	0·0571	144–165	78–85	1/64	1/32	3/32
	0·0641	144–165	78–85	1/32	1/32	3/32
	0·0808	144–165	78–85	1/32	1/16	3/32
	0·0907	144–165	78–85	3/32	1/8	1/4
	0·1019	144–165	78–85	1/4	1/4	1/4
	0·1144	144–165	78–85	1/4	1/4	1/4
	0·0201	159–172	83–87	1/64	1/32	3/32
50·5%	0·0320	159–172	83–87	1/32	1/16	3/16
	0·0359	159–172	83–87	3/64	3/32	3/16
35·3–39·5	0·0403	165–179	85–89	3/64	1/8	3/16
tons/sq. in.	0·0453	165–179	85–89	1/16	1/8	3/16
	0·0508	165–179	85–89	1/16	1/8	3/16
	0·0571	165–179	85–89	1/16	1/8	3/16
	0·0641	165–179	85–89	1/8	5/32	1/4
	0·0720	165–179	85–89	1/4	3/8	3/8
	0·0907	165–179	85–89	1/4	3/8	1/2
	0·0089	—	—	S	1/64	3/32
60·5%	0·0100	—	—	S	1/64	3/32
	0·0159	—	—	1/64	1/16	5/32
33·4–42·4	0·0201	165–179	85–89	1/32	3/32	7/32
tons/sq. in.	0·0253	165–179	85–89	1/32	5/32	∨ 1/4
	0·0320	165–179	85–89	1/32	5/32	∨ 1/4
	0·0403	176–195	88–92	3/64	7/32	∨ 1/4
	0·0508	176–195	88–92	3/32	7/32	∨ 1/4
	0·0641	176–195	88–92	1/8	1/4	∨ 1/4
68·7%	0·0253	169–185	86–90	3/64	5/32	∨ 1/4
40·0–43·9 tons/sq. in.						

S = radius less than 1/64 inch.

Table 2. BENDING OF BRASS STRIP AT RIGHT ANGLES (continued)

Percentage Reduction. Tensile Strength	Thickness Inches	Hardness Brinell	Hardness Rockwell "B"	Minimum Suitable Radius of Bend. Inches: Bend at 90° to Direction of Rolling	Bend at 45° to Direction of Rolling	Bend Parallel to Direction of Rolling
70·5%–73·5% Copper; Remainder Zinc						
20·7%	0·0050–0·0508	103–139	57–76	S	S	S
	0·0641	112–139	63–76	1/64	—	—
25·2–29·7 tons/sq. in.						
	0·0050–0·0159	—	—	S	S	S
37·1%	0·0201–0·320	141–162	77–84	1/64	1/32	3/64
31·7–36·2	0·0403	150–169	80–86	1/64	1/32	1/8
tons/sq. in.	0·0508	150–169	80–86	1/32	1/32	1/8
	0·0641	150–169	80–86	1/32	1/32	1/8
	0·0050–0·0063	—	—	S	S	S
50·5%	0·0080	—	—	S	S	1/64
	0·0100	—	—	S	S	1/32
36·8–40·9	0·0126	—	—	S	S	1/32
tons/sq. in.	0·0159	—	—	S	S	1/16
	0·0201	165–179	85–89	1/64	3/64	1/8
	0·0253	165–179	85–89	1/64	1/16	5/32
	0·0320	165–179	85–89	1/32	3/32	5/32
	0·0403	172–190	87–91	1/32	5/32	7/32
	0·0508	172–190	87–91	3/64	3/16	∨ 1/4
	0·0641	172–190	87–91	1/16	∨ 1/4	∨ 1/4
	0·0050	—	—	S	S	1/64
60·5%	0·0063	—	—	S	S	1/64
	0·0080	—	—	S	S	1/32
40·4–44·5	0·0100	—	—	S	S	1/32
tons/sq. in.	0·0126	—	—	S	S	1/64
	0·0159	—	—	S	S	1/16
	0·0201	176–195	88–92	1/32	1/32	1/8
	0·0253	176–195	88–92	1/32	1/32	1/8
	0·0320	176–195	88/92	3/64	1/16	—
	0·0403	185–205	90–94	1/16	∨ 1/4	∨ 1/4
	0·0508	185–205	90–94	1/8	∨ 1/4	∨ 1/4
	0·0641	185–205	90–94	1/8	∨ 1/4	∨ 1/4
68·7%	0·0050–0·0063	—	—	S	S	1/32
	0·0080	—	—	S	3/64	1/16
	0·0100	—	—	S	1/16	3/32
42·4–46·4	0·0126	—	—	S	1/16	—
tons/sq. in.	0·0159	—	—	S	1/16	7/32
	0·0253	185–205	90–94	3/64	5/32	∨ 1/4
	0·0320	185–205	90–94	3/64	3/16	∨ 1/4
	0·0403–0·0641	195–216	92–96	1/8	∨ 1/4	∨ 1/4

S = radius less than 1/64 inch.

sequently be operated for a short period at any temperature, up to that at which the precipitation hardening takes place, without any appreciable change of their characteristics. Unlike copper, for example, prolonged heating at relatively low temperatures does not cause annealing. The maximum operating temperatures for various alloys are referred to in Part III.

* * *

WHILST many springs are made from flat material the final shape is frequently anything but flat, and as previously stated the amount of forming required very largely determines the hardness of alloys other than those hardenable by heat treatment. The commonest operation required is the formation of right-angled bends which may be parallel to or at right angles to the direction in which the strip was rolled. If the bend is too sharp or the material too hard fracture will occur in the form of a crack on the

Table 3

BENDING OF PHOSPHOR BRONZE STRIP AT RIGHT ANGLES

Percentage Reduction. Tensile Strength	Thickness Inches	Hardness		Minimum Suitable Radius of Bend. Inches		
		Brinell	Rockwell "G" Scale	Bend at 90° to Direction of Rolling	Bend at 45° to Direction of Rolling	Bend Parallel to Direction of Rolling
94·4% min. Copper, 5·8–4·8 % Tin, 0·05–0·35 % Phosphorus						
20·7%	0·0201–0·0719	117–139	26–42	S	S	S
	0·0808	147	47	1/16	1/16	1/16
24·6–31·3	0·0907	139	42	1/16	1/16	1/16
tons/sq. in.	0·1250	139	42	3/32	3/32	3/32
37·1%	0·0201	170	59	S	1/32	1/16
	0·0319	179	64	1/64	1/16	1/8
32·2–38·9	0·0403	170	59	1/16	1/16	1/8
tons/sq. in.	0·0508	186	66	1/16	3/32	—
50·5%	0·0453	196	69	1/16	1/8	—
60·5%	0·0126	—	—	S	1/16	—
	0·0140	—	—	S	1/16	—
40·7–47·0	0·0159	—	—	1/64	3/32	—
tons/sq. in.	0·0179	—	—	1/32	1/8	—
	0·0226	205	72	1/32	1/8	—
	0·0253	205	72	1/32	1/8	—
	0·0285	190	67	1/16	—	—
	0·0319	202	71	1/16	—	—
	0·0403	210	74	3/32	—	—
	0·0452	215	75	3/32	—	—
	0·0508	215	75	3/32	—	—
	0·0641	210	74	1/8	—	—
91 % min. Copper, 7·5–8·5 % Tin, 0·05–0·25 % Phosphorus						
20·7%	0·005–0·0641	137–194	56–61	S	S	S
30·5–37·5	0·0720	147–194	47–68	S	S	1/16
tons/sq. in.	0·125	147–194	47–68	1/8	1/8	—
37·1%	0·005	—	—	S	1/64	1/64
	0·0063	—	—	S	—	1/64
38·0–44·5	0·008	—	—	S	—	1/64
tons/sq. in.	0·010	—	—	S	—	1/32
	0·0126	—	—	S	—	1/32
	0·0159	—	—	S	—	—
	0·0201	184–210	65–74	S	—	1/16
	0·0253	184–210	65–74	S	—	—
	0·0403	196–222	69–77	1/32	1/8	—
	0·0508	196–222	69–77	3/32	1/8	3/16
	0·0641	196–222	69–77	1/8	1/8	1/4

S = radius less than 1/64 inch.

Table 2. BENDING OF BRASS STRIP AT RIGHT ANGLES (continued)

Percentage Reduction. Tensile Strength	Thickness Inches	Hardness		Minimum Suitable Radius of Bend, Inches		
		Brinell	Rockwell "B"	Bend at 90° to Direction of Rolling	Bend at 45° to Direction of Rolling	Bend Parallel to Direction of Rolling
83%–86% Copper; Remainder Zinc						
20·7%	0·0050–0·0159	83–127	43–71	S	S	S
	0·0201–0·0508	83–127	43–71	S	S	1/64
20·8–25·2	0·0641	90–127	48–71	1/32	1/32	1/32
tons/sq. in.						
37·1%	0·0050–0·0126	—	—	S	S	S
	0·0159	—	—	S	1/64	1/64
27·0–31·6	0·0201	117–144	66–78	S	1/64	1/64
tons/sq. in.	0·0253	117–144	66–78	S	1/64	1/32
	0·0320	117–144	66–78	S	1/64	1/16
	0·0403	132–153	73–81	1/64	1/32	3/32
	0·0508	132–153	73–81	1/64	1/32	3/32
	0·0641	132–153	73–81	1/32	1/16	1/8
50·5%	0·0050–0·0063	—	—	S	S	1/64
	0·0080	—	—	S	S	1/32
31·3–35·5	0·0100	—	—	S	S	1/32
tons/sq. in.	0·0126	—	—	S	1/64	1/16
	0·0159	—	—	S	1/32	3/32
	0·0201	135–162	74–84	1/64	1/32	1/8
	0·0253	135–162	74–84	1/64	1/16	5/32
	0·0320	135–162	74–84	1/64	1/16	3/16
	0·0403	147–165	79–85	1/16	3/32	7/32
	0·0508	147–165	79–85	1/16	1/8	3/8
	0·0641	147–165	79–85	1/16	3/16	3/8
60·5%	0·0050	—	—	S	1/64	1/64
	0·0063	—	—	S	1/64	1/32
33·5–37·5	0·0080	—	—	S	1/64	1/16
tons/sq. in.	0·0100	—	—	S	1/64	3/32
	0·0126	—	—	S	1/32	1/8
	0·0159	—	—	1/64	1/32	3/16
	0·0201	147–176	79–88	1/64	3/32	7/32
	0·0253	147–176	79–88	1/32	1/8	3/8
	0·0320	147–176	79–88	1/16	1/8	3/8
	0·0403	156–176	82–88	1/16	3/16	1/2
	0·0508	156–176	82–88	1/16	1/4	1/2
	0·0641	156–176	82–88	3/32	3/8	1/2

S = radius less than 1/64 inch.

outer surface. As the radius of the bend is increased or a softer material is used the metal passes through a phase in which it shows what is known as an "orange peel effect" until finally if the radius is made large enough or the material is soft enough, a satisfactory bend can be made without any apparent superficial effect.

IF the bend is parallel to the direction of rolling it is necessary to use a larger radius of bend than if it is perpendicular to the direction of rolling. Often springs must be stamped with bends in both directions and then it may be an advantage to arrange that both bends are at 45° to the direction of rolling.

Valuable tests have been made by Straw, Helfrick and Fischrupp [12] and by Gohn [13] to determine the minimum radius with which it is possible to make a right-angled bend in various materials having thicknesses lying between 0.005 in. and 0.1 in. Because of the useful nature of these results, which have actually been

Table 3

BENDING OF PHOSPHOR BRONZE STRIP AT RIGHT ANGLES
(continued)

Percentage Reduction. Tensile Strength	Thickness Inches	Hardness: Brinell	Hardness: Rockwell "G" Scale	Minimum Suitable Radius of Bend, Inches: Bend at 90° to Direction of Rolling	Bend at 45° to Direction of Rolling	Bend Parallel to Direction of Rolling
91% *min. Copper*, 7·5–8·5 % *Tin*, 0·05–0·25 % *Phosphorus*						
50·5%	0·005	—	—	S	—	1/32
	0·0063	—	—	S	—	1/32
43·5–52·0	0·008	—	—	S	—	3/64
tons/sq. in.	0·010	—	—	S	—	—
	0·0126	—	—	S	—	—
	0·0159	—	—	S	—	—
	0·0201	207–230	73–79	S	—	1/4
	0·0253	207–230	73–79	1/32	—	—
	0·0320	207–230	73–79	1/32	—	—
	0·0403	218–242	76–82	3/64	5/32	> 1/4
	0·0508	218–242	76–82	—	3/16	> 1/4
	0·0641	218–242	76–82	5/32	> 1/4	> 1/4
60·5%	0·005	—	—	S	1/64	3/64
	0·0063	—	—	S	1/32	3/32
47·0–53·0	0·0080	—	—	S	3/64	3/32
tons/sq. in.	0·0100	—	—	1/64	1/16	1/8
	0·0126	—	—	1/64	3/32	5/32
	0·0159	—	—	1/32	3/32	5/32
	0·0179	—	—	1/32	1/8	7/32
	0·0201	218–242	76–82	1/32	1/8	1/4
	6·0253	218–242	76–82	1/32	5/32	3/8
	0·0320	218–242	76–82	3/32	3/16	1/2
	0·0359	218–242	76–82	3/32	7/32	1/2
	0·0403	230 or over	79–85	3/32	1/4	1/2
	0·0453			1/8	3/8	1/2
	0·0508			1/8	3/8	1/2
	0·0641			5/32	3/8	3/4
	0·0907			7/32	1/2	3/4
68·7%	0·0050	—	—	S	—	1/16
	0·0080	—	—	1/64	—	3/32
49·0–54·5	0·0126	—	—	1/64	—	—
tons/sq. in.	0·0159	—	—	1/64	—	—
	0·0201	226–245	78–83	1/32	—	—
	0·0641	240 or over	81–86	5/32	> 1/4	> 1/4

S = radius less than 1/64 inch

Table 4

BENDING OF NICKEL SILVER STRIP AT RIGHT ANGLES

Percentage Reduction. Tensile Strength	Thickness Inches	Hardness: Brinell	Hardness: Rockwell "G" Scale	Minimum Suitable Radius of Bend, Inches: Bend at 90° to Direction of Rolling	Bend at 45° to Direction of Rolling	Bend Parallel to Direction of Rolling
70·5%–73·5% *Copper*, 8·5%–11·5% *Zinc*, 16·5%19·5% *Nickel*						
20·7%	0·0050–0·0359	—	—	S	S	S
	0·0403	156	52	—	1/64	1/32
29·3–32·9	0·0508	—	—	S	—	—
tons/sq. in.	0·0641	154	51	—	3/32	3/32
	0·0720	149	48	3/32	3/32	3/32
	0·0907	158	53	3/32	3/32	1/8
37·1%	0·0050–0·0159	—	—	S	S	S
	0·0201	147	47	S	S	1/64
33·5–36·6	0·0253	—	—	S	S	—
tons/sq. in.	0·0320	—	—	1/16	S	1/16
	0·0403	—	—	1/16	1/16	1/16
	0·0508	165	57	1/16	1/16	1/16
	0·0571	170	59	3/32	3/32	3/32
	0·1019	174	61	1/8	1/8	1/8
50·5%	0·0050–0·0159	—	—	S	S	S
	0·0253	—	—	1/64	1/64	1/32
36·2–39·3	0·0320	—	—	1/8	1/8	1/8
tons/sq. in.	0·0403	—	—	1/8	1/8	3/16
	0·0508	—	—	5/32	1/8	7/32
60·5%	0·0050–0·0080	—	—	S	S	S
	0·0100	—	—	S	S	1/64
	0·0126	—	—	1/64	1/64	1/64
	0·0159	—	—	1/64	1/64	1/64
	0·0201	—	—	3/64	3/64	3/32
	0·0253	—	—	3/64	3/64	3/16
	0·0320	—	—	5/32	3/16	3/16
	0·0403	—	—	5/32	7/32	7/32
	0·0508	—	—	5/32	—	—
	0·0641	—	—	> 1/4	> 1/4	> 1/4
68·7%	0·0050–0·0063	—	—	S	S	S
	0·0080–0·0100	—	—	S	1/64	1/64
	0·0126	—	—	1/64	—	—
	0·0159	—	—	1/64	1/32	—
	0·0253	—	—	3/64	1/8	—
	0·0320	—	—	5/32	7/32	—
	0·0403	—	—	5/32	7/32	1/4
	0·0508	—	—	5/32	1/4	—

S = radius less than 1/64 inch.

employed with success in the design of telephone equipment for some years, they are reproduced in detail in Tables 2 to 5. The tests on which the results are based were made with flat strip using a right-angled vee notch and right-angled punch. The angle made by the strip was more than a right angle, depending on the temper and thickness of the material. In the punching operation the ends of the strip were not restrained in any way. A satisfactory bend was considered to be one which showed no pronounced "orange peel" effect. The authors admit that grain size and impurities may affect the results.

IT will be noticed, except when the material is relatively soft or thin, the minimum possible radius occurs when the strip is bent at right angles to the direction of rolling and the maximum radius when the bend is parallel to the direction of rolling. If the bend is at 45° to the direction of rolling the radius of

Table 4

BENDING OF NICKEL SILVER STRIP AT RIGHT ANGLES (continued)

Percentage Reduction. Tensile Strength	Thickness Inches	Hardness Brinell	Hardness Rockwell "G" Scale	Minimum Suitable Radius of Bend, Inches: Bend at 90° to Direction of Rolling	Minimum Suitable Radius of Bend, Inches: Bend at 45° to Direction of Rolling	Minimum Suitable Radius of Bend, Inches: Bend Parallel to Direction of Rolling
53·5%–56·5% Copper, 25·5%–28·5% Zinc, 16·5%–19·5% Nickel						
20·7%	0·0050–0·0319	149–190	48–67	S	S	S
	0·0403–0·0508	184–200	65–70	1/16	1/16	1/16
35·0–41·6 tons/sq. in.	0·0571–0·0641	186–200	66–70	1/16	1/16	3/32
	0·1144	196	69	1/8	1/8	—
37·1%	0·0100	—	—	S	S	1/64
	0·0201	202	71	1/32	1/32	3/32
41·3–51·4 tons/sq. in.	0·0319	200	70	1/16	1/16	3/32
	0·0452	207	73	1/16	1/16	3/32
	0·0641	207	73	3/32	3/32	>1/8
	0·0907	210	74	>1/8	>1/8	>1/8
50·5%	0·0050–0·0063	—	—	S	S	S
	0·0080–0·0100	—	—	1/64	1/64	1/64
45·5–51·4 tons/sq. in.	0·0126	196–227	69–78	1/64	1/64	1/64
	0·0142	196–227	69–78	1/64	1/64	1/32
	0·0159	196–227	69–78	1/32	3/64	1/8
	0·0179	196–227	69–78	1/32	3/64	1/8
	0·0201	205–229	72–79	3/64	3/32	1/8
	0·0226	205–229	72–79	1/16	3/32	1/8
	0·0253	205–229	72–79	3/32	3/32	1/8
	0·0285	205–229	72–79	3/32	3/32	3/16
	0·0320	205–229	72–79	3/32	3/32	3/16
	0·0359	205–229	72–79	1/8	1/8	3/16
	0·0403	215–242	75–82	1/8	5/32	3/16
	0·0508	215–242	75–82	1/8	5/32	7/32
	0·0641	215–242	75–82	5/32	3/16	3/8
	0·0808	215–242	75–82	1/4	1/4	3/8
	0·0907	215–242	75–82	3/8	3/8	3/8

S = radius less than 1/64 inch.

Table 5

BENDING OF MISCELLANEOUS COPPER ALLOYS AT RIGHT ANGLES (all 0·0201 inch thick)

Alloy	Percentage Reduction.	Ultimate Tensile Strength,* tons/sq. in.	Hardness Brinell	Hardness Rockwell	Minimum Suitable Radius of Bend, Inches: Bend at 90° to Direc., tion of Rolling	Minimum Suitable Radius of Bend, Inches: Bend at 45° to Direction of Rolling	Minimum Suitable Radius of Bend, Inches: Bend Parallel to Direction of Rolling
Brass (61%–64% Copper, 1·25%–2% Lead)	37·1%	30·4–34·8	100–105	75–83	S	1/32	1/32
	60·5%	38·0–42·2	105–108	85–89	1/16	5/32	>1/4
Brass (64%–67% Copper, 1% Lead)	37·1%	30·4–34·8	100–105	75–83	3/64	3/64	1/16
	60·5%	—	—	—	1/16	5/32	1/4
Brass (73%–76% Copper)	37·1%	—	—	—	1/32	3/64	7/32
	60·5%	—	—	—	1/32	3/32	7/32
Brass (80% Copper)	37·1%	—	—	—	1/32	3/64	1/16
	60·5%	—	—	—	1/32	1/8	3/16
Manganese Brass (63%–66% Copper, 1% Manganese)	37·1%	—	—	—	S	1/64	3/64
	50·5%	—	—	—	1/32	1/16	1/8
	60·5%	—	—	—	1/32	1/8	1/4
Copper-Silicon Alloys 96·0% Copper	37·1%	—	—	—	1/32	1/32	1/16
	60·5%	—	—	—	3/64	3/32	3/16
Copper	20·7%	16·5–19·6	—	30–50	1/32	1/32	3/64
	50·5%	20·5–24·5	—	50–62	1/64	1/32	1/32
Beryllium Copper* (97·75% Copper, 2·25% Beryllium)	Soft	—	—	—	S	S	S
	Half-hard	—	—	—	1/16	3/32	1/8
	Hard	—	—	—	3/16	7/32	>1/4

S = radius less then 1/64 inch.

* After heating for 1 hour at 800° C. and quenching. Samples 0·0403 inch thick.

bend lies between these two values. In some cases the effect of making a bend in the direction of rolling instead of at right angles to it is to increase the permissible radius by as much as eight to one. Table 2 gives very full data for three brasses; limited results for three other brasses are shown in Table 5 with data for various other materials including copper and beryllium copper. From Table 3 it will be seen that the phosphor bronze, having the higher tin content requires, for any given thickness and temper a slightly larger radius. Of the two nickel-silvers of which details are given in Table 4, the second is the one most commonly used for springs in this country. The first column in each table is headed

(*Please turn to page* 395)

National Instrument Conference and Exhibit

PLANS have been completed for the first National Instrumentation Conference and Exhibit to be held in the Wm. Penn Hotel, Pittsburgh from Monday, September 16th to Friday September 20th, 1946. The Instrument Conference and Exhibit, sponsored by The Instrument Society of America, was originally planned for the corresponding week in September, 1945, but was changed to avoid interferring with the heavy transportation demands at that time.

* * *

THE Instrument Conference held in conjunction with the Exhibit will include daily technical sessions. Several other societies are planning instrumentation programs in Pittsburgh at that time.

* * *

AN unusual feature of the technical program will be a series of educational courses (short courses) which will be directed by Dr. B. R. Teare, Professor in charge of Electrical Engineering at the Carnegie Institute of Technology. Dr. Teare is Chairman of the Educational Committee of The Instrument Society of America.

* * *

ADVANCE indications are that the show will be a "sell out" as over 75 companies have already indicated that they will be represented.

* * *

Folder Describes "Nukemite"

THIS new product, developed during the war, is an acid and alkali proof plastic "coating", which is now available for industrial use. It is good for any purpose where this protection is needed — floors, structural steel, tanks, pipes, drums and so forth.

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A COPY of the folder and samples are available to our readers. Please address Nukem Products Corporation, 111 Colgate St., Buffalo 20, N. Y.

* * *

Issues Two New Technical Data Sheets

AMERICAN CHEMICAL PAINT Co., Ambler, Pa., has issued two data sheets that should be of interest to many of our readers.

* * *

NO. 13-9-2-11 supplies detailed directions for cuprodizing stainless steels, supplementing information given previously in No. 13-9-2-2.

* * *

NO. 7-11-101 describes Thermoil-Granodine, a phosphate coating that may be applied to many metal parts to promote corrosion and wear resistance or to provide a base for painting. The details regarding the coating are covered both in the text and by illustrations.

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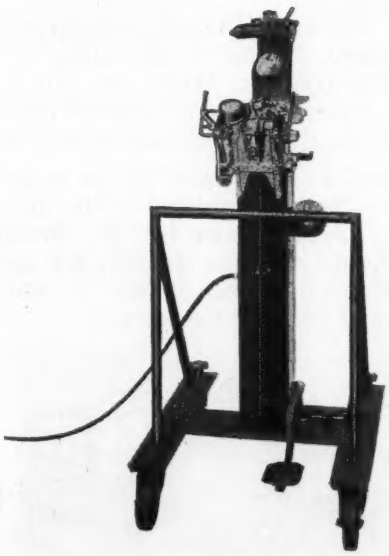

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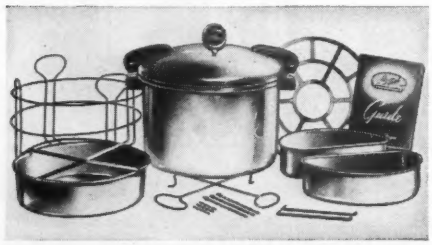

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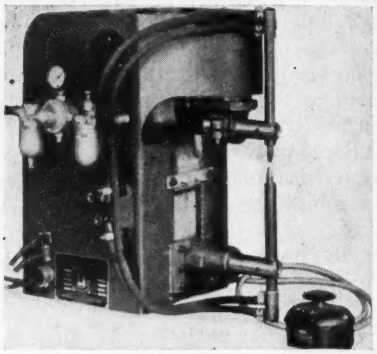


THIS unit is similar to the popular 3 KVA welder used extensively in the manufacture of radio and electrical steel parts, toys and household novelties, but the capacity and multiple uses of the unit have been increased and several unique features, suggested by users, have ben incorporated.

* * *

FOUR steps of adjustable weld heat control delivers a secondary maximum of 12,500 amperes so that it may successfully weld two thicknesses of 16 gauge clean sheet steel. An air accessory unit consisting of an air filter, air regulator, pressure gauge and air lubricator insures clean lubricated air delivery to the air cylinder.

* * *

OPERATING equipment includes an improved pressure switch, four way solenoid air valve, a heavy duty butt contact type inbuilt welding contactor, an air flow regulating valve for adjustment of point impact speed and a foot switch and water cooled electrode holders for No. 1 Morse taper welding tips.

* * *

STANDARD units have a throat depth of 9 inches. Up to 16 inches can be obtained by factory modification of the upper cylinder press head mounting. The lower arm is adjustable up and down for a wide range of work. Complete information can be obtained from the **Universal Welder Corporation,** 761 Carnegie Ave., Cleveland 15, Ohio, mentioning this publication.

New Testing Machine

RADICALLY new design features are built into this test machine recently installed in the Research Laboratories of the **Okonite-Callender Cable Co., Inc.**, Patterson, N. J., who are using this equipment in connection with their studies on lead cable sheaths. The machine checks the response of this metal to various treatments and chemical composition whether "as purchased" or deliberately "built" into the lead to develop specific characteristics such as resistance to fatigue and corrosion, lower creep, more uniform crystal structure.

* * *

KNOWN as the S-60 Universal Hydraulic Testing Machine, this device is able to measure the following characteristics: soundness of cable sheath welds, tensile stress, modulus of elasticity, elongation and ductility, compression, Brinnell hardness, bending, sheer and uniformity. In addition to lead, many other materials used in cable manufacture can be tested including metals, fabrics, plastics, paper and rubber-like materials.

* * *

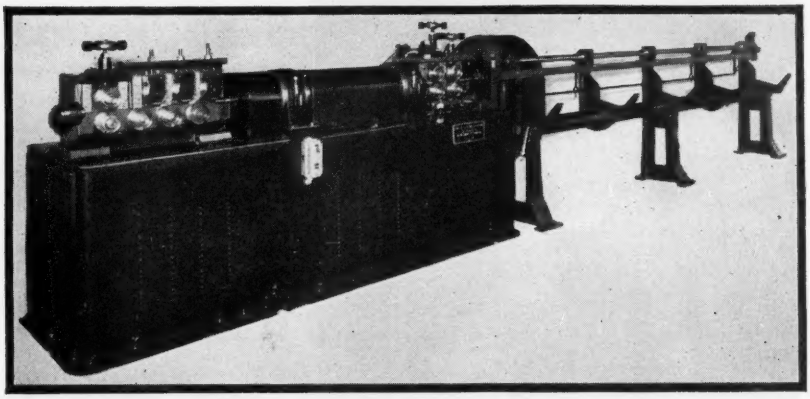
REPLACING at least 3 other types of equipment previously used, the new machine consists of an assembly that combines such important features as:

(1) **A dead-weight load indicating system sensitive over an unusually wide range. (The operating range of the machine is from 120 lb. to 12,000 lb. but tensile strength tests are regularly being made with satisfactory accuracy at as low as 5 lb.)**
(2) **Location of test specimens brought close for convenience of operation and ease of observation.**
(3) **Several scale ranges possible by using different pendulum weights.**
(4) **Smooth, hydraulic load applications with a wide variety of testing speeds. The rate of movement can be varied from zero to 8¾ inches per minute under exact speed control, the length of stroke being 25 inches. Slow rates are used for materials like lead which have relatively high creep rates under tension. Faster speeds are used for fabrics, other metals, etc.**

* * *

Builds Research Laboratory

THE **CARPENTER STEEL CO.** has announced plans for a modern, new research laboratory. Ground has been broken at the company's mills in Reading, Pa., for the new three story structure.



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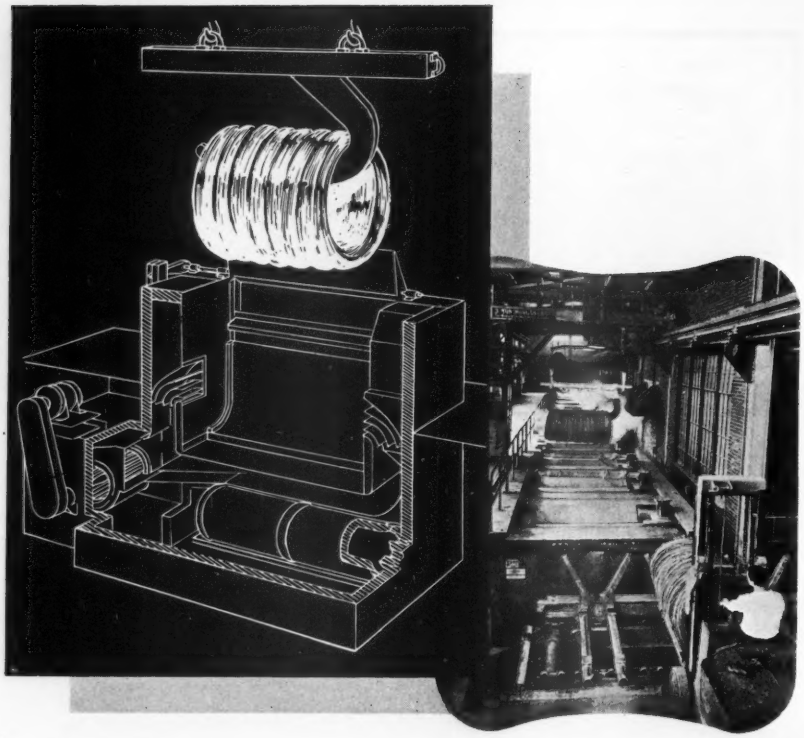

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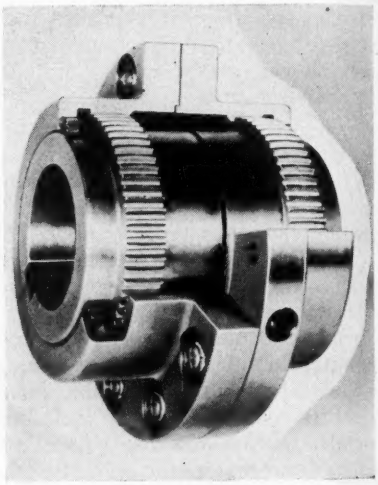
THE Coupling Division of **John Waldron Corporation** announces that a new "Series A" Coupling has been designed for a much larger maximum bore to permit use of smaller sized couplings than would ordinarily be required. The smaller size coupling takes up less space, needs less shaft extension, looks better and costs less.



IT retains the exclusive construction refinements that have been basic in Waldron Couplings: all steel, made to close manufacturing tolerances, dust proof, oil tight, identical externally geared hubs that key to shafts, enclosed by one piece male and female sleeves that function as a single rigid unit. The "Series A" Coupling compensates for misalignment without adding stress to shaft or bearings. It is made in Standard, Heavy Duty, Marine, Mill Motor, Floating Shaft, Jordan, Shear Pin, Oil Collector and Cut-Out types.

* * *

CATALOG 57 will be ready for issuance in the very near future and interested coupling buyers may obtain copies by writing to John Waldron Corporation, New Brunswick, New Jersey.

An ADVERTISER likes to know his ads have been read, so please mention WIRE & WIRE PRODUCTS when writing him.

Outstanding Personalities of the Wire Industry

Thomas C. Kern, Superintendent, Rod and Wire Division, Bethlehem Steel Corporation, Bethlehem, Pa.

THOMAS C. KERN, assistant superintendent, Gautier Division, Johnstown, Pa., plant, **Bethlehem Steel Company**, has been named superintendent of the rod and wire department, succeeding **C. T. Ward**, who died March 11th. Mr. Ward had headed the department since 1939.

* * *

MR. Kern started at the Johnstown plant in June, 1922, in the Franklin open hearth under the late **L. F. Quigg**. He was later transferred to the metallurgical office as chief inspector of the Franklin mills. and in 1926 he was made metallurgical observer. In 1930 he became metallurgical contact man and in August, 1936, he was appointed assistant superintendent of the Gautier division, the post he has held until the present time.

* * *

A veteran of World War I, Mr. Kern is a graduate of Pennsylvania State College in metallurgical engineering, receiving his B.S. degree in 1921 and his M.S. in 1922.

* * *

Frick Joins Carbide Die & Mold Co.

George W Frick, Exec. Vice Pres. Carbide Die and Mold Co. Pittsburgh, Pa.

ANNOUNCEMENT that **George W. Frick** has been appointed Executive Vice President was made recently by **Jess W. Spiker**, President of **Carbide Die & Mold Company**. Mr. Frick will also direct the company's sales. The firm manufactures precision sintered carbide dies and molds, wear parts, and special tools for the powdered metals, ceramics, and pharmaceutical tablet manufacturing fields. Mr. Frick resigned as General Manager of Sales of the Firth-Sterling Steel Co. March 30th, to take over his new duties.

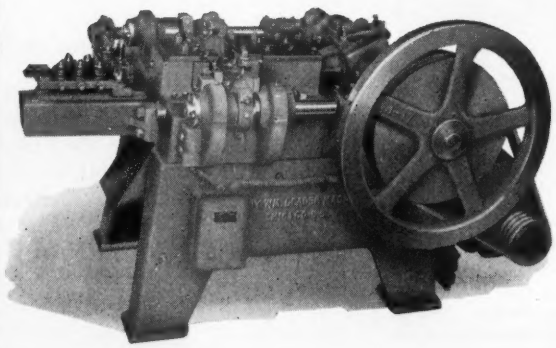
* * *

L. G. Wickwire to Handle Purchasing for Wickwire

ORRA K. GEORGE, purchasing agent of **Wickwire Bros.**, Inc., Cortland, N. Y., has retired, and **Lyman G. Wickwire**, recently returned from service with the U. S. Navy, has been appointed purchasing agent.

(*Please turn to page* 392)

GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS

210 No. Racine Ave.
Chicago 7, Illinois

Outstanding Personalities of the Wire Industry

(*Continued from page* 391)

Holbrook Joins Morgan

ADAMS HOLBROOK has been added to the staff of the **Morgan Construction Co.**, Worcester, Mass. He formerly served at the Worcester Polytechnic Institute on duties in connection with their Washburn shops and also as an instructor.

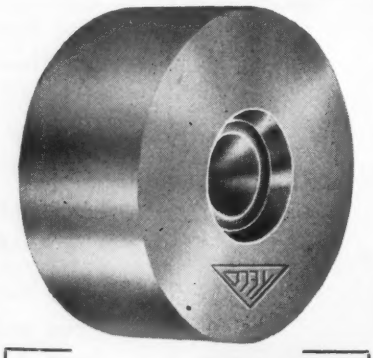
Gustafson Joins Ajax Electric Company

A. A. GUSTAFSON has been appointed Sales Engineer for the **Ajax Electric Company** of Philadelphia. Mr. Gustafson will maintain offices at 2580 University Avenue, St. Paul 4, Minnesota, from which he will cover Minnesota, North and South Dakota, and northern Wisconsin. He was formerly connected with E. F. Houghton & Company.

Longer Runs, More Tons
WITH
TECO Carbide Dies!

TECO Carbide Dies give you greater wire tonnage per die, because they maintain correct size and finish for longer runs. Your machines waste less time in die changing shutdowns — work more hours each week.

This longer-wearing, smoother-wearing performance is due to the hardness, density and uniformity which gives TECO Cemented Carbide greater resistance to wear and friction. Remember — it's the Carbide that does the work. Use the best —TECO! Let our engineers know your needs.



WIRE and BAR DIES • SIZING DIES
EXTRUDING DIES • TUBING DIES
Carbide Blanks, Tools, Bits,
Reamers, Broaches, Forming Tools

TUNGSTEN ELECTRIC CORPORATION — 564 39th St., Union City, N. J.
Branch Office: 403 Western Reserve Bldg., Cleveland 13, Ohio
Representative: Architects & Builders Bldg., Indianapolis, Ind.

TECO Pioneers in Tungsten Carbides for over a Quarter Century **CARBIDE DIES**

Hulse Becomes Chief Engineer for Youngstown Sheet & Tube

ALBERT J. HULSE, formerly with Carnegie-Illinois Steel Corporation at Pittsburgh, has joined **The Youngstown Sheet and Tube Company** as chief engineer. He succeeds J. D. Jones who left the company about a year ago.

* * *

MR. HULSE came to the Youngstown district in 1925 as chief draftsman for Trumbull Steel Company in Warren, after serving as draftsman for several steel companies. Later, he became assistant chief engineer for the H. A. Bressert Company, consulting engineers of Chicago.

* * *

IN 1935, he went with Carnegie-Illinois Steel Corporation as assistant chief engineer at their South Chicago Works, and was appointed chief engineer a short time later. A few weeks before Pearl Harbor, he was transferred by U.S. Steel Corporation to Columbia Steel Company to fill the position of chief engineer on the construction of Geneva Steel Works for the U. S. Government at Provo, Utah, the largest of war-time steel expansion projects. Upon completion of the Geneva project, he returned to Carnegie-Illinois as senior staff engineer in the Pittsburgh Office.

* * *

Hecht to Direct Sales for Willey's

IRVING A. HECHT has been appointed general sales manager of **Willey's Carbide Tool Co.**, 1340 W. Vernor Highway, Detroit, after serving for three years as manager of Willey's Chicago office, and as a member of the U. S. Coast Guard Reserve.

* * *

MR. Hecht graduated in mechanical engineering from Massachusetts Institute of Technology, and is well qualified by experience and background to render valuable service to the customers of Willey's Carbide Tool Co.

* * *

Steel Men from the Netherlands Complete Tour of American Wire Mills

A. S. de **MUINCK KEISER**, Director of the Nederlandische Staalfabrieken of Utrecht, accompanied by **G. A. Romer**, Engineer, spent most of February and March in this country to acquaint themselves with developments in the steel industry that had taken place during the war, through which period they had been pretty much shut off from the rest of the world.

* * *

THEY were particularly interested in developments in the manufacture of wire and wire products and equipment relating thereto. In writing the Wire Association to express appreciation of the assistance given Mr. de Muinck Keiser said:

* * *

"DURING our discussions with leading gentlemen in these industries, we were mightily impressed by the cordial way in which we were received and by the open-hearted and efficient manner in which different subjects relating to the manufacture of wire and wire products were explained; during the tour of the factories we were deeply impressed by the practical way in which many workshops were fitted out and the great importance which the management apparently bestowed on the erection of the most modern machines and the most efficient working methods. The thoroughness with which everybody from high to low accomplished his task, also struck us especially".

* * *

THE foregoing may also be taken as an expression of appreciation for the many courtesies extended to them by our industry.

* * *

Shanklin Advanced by Dewey & Almy

DUNBAR L. **SHANKLIN**, with **Dewey & Almy Chemical Co.**, Cambridge, Mass., since 1924, has been appointed to the newly created post of assistant director of the research laboratories, in charge of container sealing research. **George W. Blackwood** is succeeding Mr. Shanklin as manager of the Container Division.

* * *

Longnecker Becomes Division Superintendent for American Steel and Wire

WALTER L. **LONGNECKER** has been appointed division superintendent of the rod mills in the Cuyahoga Works of the **American Steel & Wire Co., a U. S. Steel subsidiary** in Cleveland.

* * *

MR. Longnecker, a native of Erie, Pa., joined the company in 1939 at its Donora plant following his graduation from Worcester Polytechnic Institute, at Worcester, Mass. In 1944 he became general foreman of the rod mills at Donora, Pa., and in June 1945 he was made division metallurgist, rod mills with offices in Cleveland.

* * *

Edvar Added to Engineering Staff of Ajax Electric Co.

TORSTEN F. A. **EDVAR** has been appointed to the Engineering Staff of the **Ajax Electric Company**, Philadelphia. He was formerly Chief Engineer of the **Harold E. Trent Company**, also of Philadelphia, Penna.

* * *

OVEN ENGINEERING NEWS

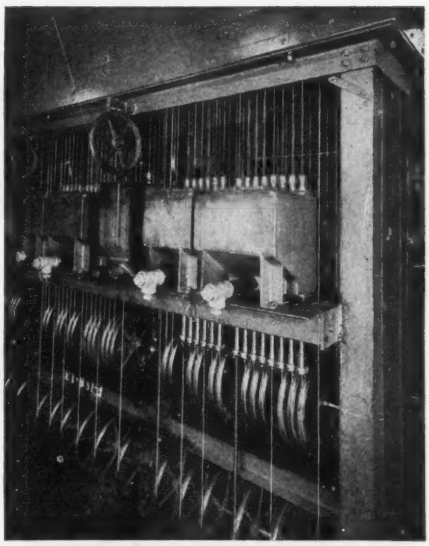
Country's Largest Strand Coating System Features Constant Tension and Variable Speed Handling

The coating equipment shown on this page, designed and built by IOE engineers, is the biggest installation of its type in the country, having a total capacity of 40,000,000 feet of production per month through 21 consecutive continuous resin coats. In designing and building this equipment the previous processing time of several hours for a complete operation was reduced to minutes, effecting a tremendous saving in time and money.

This equipment not only makes 21 consecutive coats or dips continuously and at very high speeds, but is capable of applying many different types of coatings, including lacquers, varnishes, solvent resins, water dispersed resins, and latex, thru any number of coats up to and including twenty-one.

This particular equipment handles eight consecutive ends which operate independently of each other although having a common drying unit. Speeds are independently variable and depend on the material, the type of coating and the diameter of the cord being processed. Each end of the cable or cord is equipped with its own constant tension variable speed uptake unit.

An installation such as this has a wide number of uses, being capable of processing wire, cord, cable, rope and other continuous filament materials of similar cross section within wide limitations of size, material and process.



Multi-coat coating system showing arrangement of coating pot and driving sheaves.

Industrial Oven Engineering builds similar systems that have proven unusually economical to operate because they have always been rigidly engineered with an eye to operating and maintenance economies and to exact processing requirements.

IOE ENGINEERING VERSATILITY
THE INDUSTRIAL Oven Engineering COMPANY
13825 TRISKETT ROAD, CLEVELAND 11, OHIO
* ASSOCIATED COMPANY: JAMES DAY MACHINERY LTD., LONDON, W. 1, ENGLAND *

A REVIEW OF RECENT WIRE PATENTS

No. 2,395,872, AIR-SPACE INSULATED CONDUCTOR, patented March 5, 1946 by Hans D. Isenberg, Wilmette, Ill.

The wire conductor is held spaced from the tubular outer covering by flat insulating elastic strips wound helically and arranged in groups.

★ ★ ★

No. 2,396,256, WIRE FENCE AND CAMOUFLAGE STRUCTURE, patented March 12, 1946 by Crosby Field, Brooklyn, N. Y., assignor to Brillo Manufacturing Company, Inc., a corporation of New York.

A camouflage material is provided comprising a self supporting frame of longitudinal and cross wire members secured together at points of intersection, and ribbons of metal wool, substantially equal in width to the distance between adjacent longitudinal members, secured in parallel relation on the frame, with their respective edges continuous with these longitudinal members.

★ ★ ★

No. 2,396,734, MAGNETIC MINES-SWEEPING UNDERWATER ELECTRODE, patented March 19, 1946 by Warren L. Williams, Jr., United States Navy.

This electrode is made up of a number of layers of wires, the center of the electrode consisting of wires of suprous materials and the periphery of the electrode consisting of wires of ferrous materials.

Complete Description and Drawings of Patents May Be Had for 25 cents outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

No. 2,397,082, SEMICONDUCTING MATERIAL patented March 26, 1946, by Harry H. Barker, Irwin, Pa., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania.

About the central wire conductor is insulation of high ohmic resistance applied to the conductor and semiconducting material applied to the surface of the insulation, the semiconducting material comprising a first, coating including finely pulverized natural anthracite coal, a layer of porous tape sinking into the first coating and a second coating also including finely pulverized natural anthracite coal applied over the porous tape.

★ ★ ★

No. 2,397,100, HAIRPIN, patented March 26, 1946 by Ruth K. Gaylord and Irving Richard Green, Chicago, Ill., assignors to Gaylord Products, Incorporated, Chicago, Ill., a corporation of Delaware.

A wire hairpin is disclosed, made up of a single length of wire with three hair-receiving pockets intermediate its length, formed by bends in the wire.

★ ★ ★

No. 2,397,216, SOCKET HEAD SCREW, patented March 26, 1946 by Domnic V. Stellin, Bronx, N. Y.

The head is formed with a recess having a number of symmetrically arranged faces, one end of this recess being of a uniform cross-sectional area and co-axial with the screw, and an adjacent portion of the recess tapering inwardly of the screw at an angle of about 5° to the screw axis, the tapering portion being truncated in a plane perpendicular to its axis.

★ ★ ★

No. 2,397,244, DEEP DRAWING STEELS CONTAINING CHROMIUM, patented March 26, 1946 by Walter Crafts and Cecil G. Chadwich, Niagara Falls, N. Y., assignors to Electro Metallurgical Company, a corporation of West Virginia.

These inventors provide a deep drawing chromium-killed steel (other than a steel having over 0.07% of phosphorous) containing between 0.01% and 0.20% carbon, between 0.10% and 1% manganese, between 0.20% and 2% chromium, remainder iron and incidental impurities; the steel being free from deoxidizing elements, and deoxidation products, other than the chromium and manganese.

(*Please turn to page* 405)

Copper and Copper Alloy Springs

(*Continued from page* 386)

"Percentage Reduction", a phrase which indicates the reduction of thickness to which the material was subjected by rolling subsequent to the last annealing operation. Thus if a 1" thick annealed billet is rolled without further annealing until it has a thickness of 0.1" the material is said to have had a percentage reduction of thickness of 90. The higher the percentage reduction the greater the hardness of the material.

* * *

Helical Springs

WHILST flat springs may be made from copper alloys because they e required to carry current in ctrical apparatus, this is seldom case with helical springs, which we their manufacture in non-fer- us metals very largely to the cor- sion resistance of these materials. elical springs are made by winding und, elliptical, square or rectan- lar wire under tension on a man- which is slightly smaller than required final internal diameter of the spring. The operation is usually performed in a lathe or similar machine specially designed for spring making — the wire holder or guide being traversed at the correct speed to form the appropriate spiral by means of gearing, as in screw cutting.

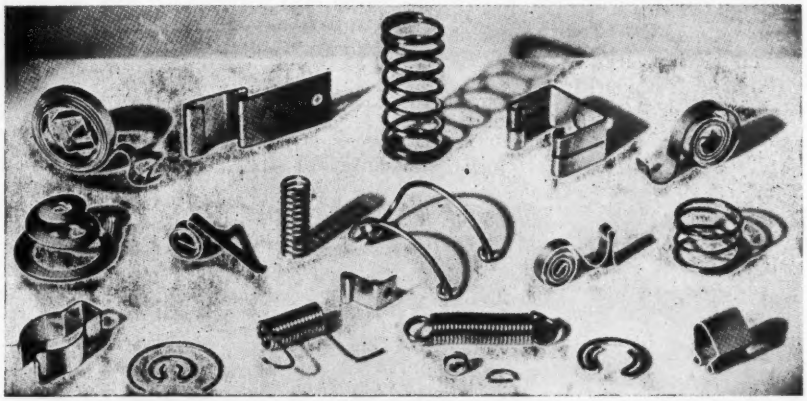
* * *

SPECIAL springmaking machines are also sometimes used in which the wire is fed in by rollers and forced into contact with a mandrel by special guides. The mandrel is short and overhung so that a continuous spring is delivered by the machine and may be automatically cut to appropriate lengths.

* * *

ONE of the difficulties in making springs is to determine the correct size of mandrel so that on release of tension the final size of the spring is correct. The increase of

(*Please turn to page* 396)



Typical Copperano Copper Alloy Springs

YOU ARE INVITED TO JOIN . . . . . .

THE WIRE ASSOCIATION

To those wire mill men who have not already joined the Wire Association for the mutual benefit of those engaged in the operating end of the Wire Industry, a cordial invitation is extended to become a member.

If you are making rods and wire—of steel, copper, brass, alloy or any ferrous or non-ferrous metal, or are in the wire products end—nails, bolts, screws, rivets, wire rope, wire cloth, springs, electric wire and cable or any of the numerous products made of wire, you will benefit by identifying yourself with the Association.

The Wire Association is a non-profit organization of wire and wire products mill superintendents, executives and foremen, whose specific purpose is to improve production methods and afford a clearing house for ideas on management, technical and research problems, and to develop and maintain friendly relations among members.

Dues, including a subscription to WIRE AND WIRE PRODUCTS, a copy of the BUYERS GUIDE and the various services to members, $15.00 per year. Please write today for a membership application card.

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

300 MAIN STREET STAMFORD, CONN.

Copper and Copper Alloy Springs

(*Continued from page* 395)

coil diameter which occurs depends on the mechanical characteristics of the material as well as the dimensions of the spring, and the predetermination of this from theoretical considerations is a complicated, if not impossible task, depending as it does very largely on the behaviour of the material at stresses greater than the elastic limit. For a spring to be formed at all at normal temperatures it is clear that permanent set must take place and that this is accompanied by elastic deformation which is recovered on the removal of tensión. As a result the spring slightly uncoils, increases in diameter and may increase in length —all of which is quite familiar to anyone who has ever made a spring. For some materials tables are available showing the size of mandrel to use for various gauges of wire and diameter of spring. In the absence of such information there are two courses which may be adopted: (1) trial and error; (2) wind a spring of the desired gauge of wire on a tapered mandrel noting carefully the final diameter of the coils corresponding to various points on the mandrel; in this way a curve may be plotted relating mandrel diameter to final spring diameter, and so an appropriate parallel mandrel size chosen.

* * *

THIS method of making a spring leaves the material in a state of internal stress. In forming a spring the material at the inside of the coil, adjacent to the mandrel, is compressed, whilst that at the outside is extended, and at some intermediate point there is a neutral axis which remains of constant length. At the extreme surfaces of the wire the compression and extension exceed the elastic limit, but as the neutral axis is approached the permanent set diminishes until finally all the extension is elastic. This is shown in Fig. 8(a) where the original plane AB is displaced, by forming the spring, to the position A'B' on partial release of stress the wire recovers until the plane A'B' retracts to the position A"B", as shown in Fig. 8(b). This plane is displaced from the original one by the permanent set plus an elastic extension varying across the section but being zero at the outer and inner surfaces and also at the neutral axis. The material is thus clearly in a state of internal stress which will result in the final displacement of A"B" slightly towards AB to the position A"'B"' to enable the internal forces to be statically balanced, as shown in Fig. 8(c). These internal forces can be eliminated by a low temper-

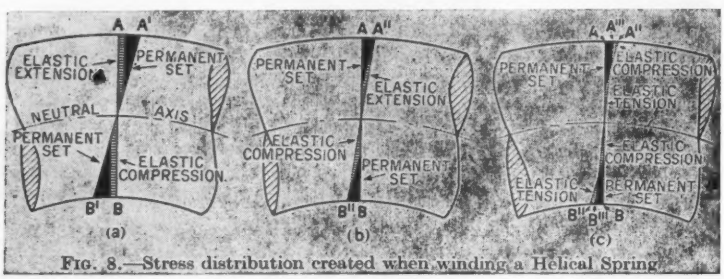


FIG. 8.—Stress distribution created when winding a Helical Spring

EXTRUDER TAKE-UP . . . . .

We have developed a new type of electrical driven take-up for use in connection with the insulation of small wires.

The speed of the take-up and the tension of the wire is controlled by the wire itself. We have several of these machines in continuous operation for over six months and they are working satisfactorily.

We can vary the speed from 75 to 1000 feet per minute and vary the tension so that we can run wires as small as 7-#35 strand with 10 mill wall. We can run reels as large as 30" diameter with a 14" traverse.

The unit consists of a motor, variable speed drive, outboard main shaft mounted on ball bearing pillow blocks, and an adjustable electrically operated traverse with necessary contactors to operate the motor and motor controls to vary the torque of the motor and the tension of the wire.

This unit is inexpensive in cost and we can make prompt delivery.

For further information write the

R. L. DAVIS ELECTRIC COMPANY

WALLINGFORD, CONNECTICUT

ature heat treatment such as, for example, half an hour at 150° C. to 200° C., which is suitable for phosphor bronze. Carson makes the following suggestion for instrument springs:

Phosphor Bronze	**120° C. or 20 hours**
Hard Drawn Brass	**165° C. for 15 hours**
Nickel Silver	**195° C. for 8 hours**

* * *

TWO methods are suggested above for ensuring that the final size of a helical spring is correct. There is a third method which is an adaptation of the method used for "setting" spiral springs, namely to wind the helix on a mandrel having the same diameter of the spring, fix the wire in position and give a low-temperature heat treatment which is just sufficient to convert all the elastic deformation into permanent set. The spring will then not change its dimensions on removal from the mandrel. This method of setting is described in detail in the next section.

BY winding springs (of hard-drawn wire) with a negative "lead" (sometimes known as "back-wind") they may be obtained with quite a considerable initial tension which is very useful for certain applications. It has been stated that by this method the initial tension can reach as much as 25% of the load at the torsional elastic limit of the material, and there are special methods for obtaining considerably higher figures. It is not possible to do this with springs made from precipitation hardening materials, since the hardening treatment relieves the internal stress produced in back-winding.

* * *

Spiral Springs

ONE of the chief uses for copper alloy spiral springs is in electrical measuring instruments as means for conducting current to and from a moving coil and as a means of control whereby the deflection is proportional to the applied torque. If the instrument is of the

(*Please turn to page* 398)

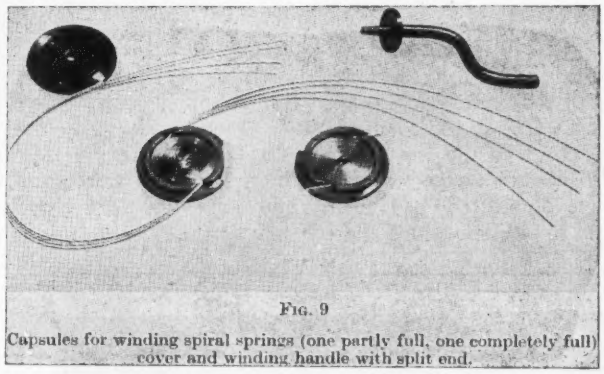


FIG. 9

Capsules for winding spiral springs (one partly full, one completely full) cover and winding handle with split end.

DIAMOND POWDER FOR THE DIE ROOM

Diamond powder is a product about which you can't tell a thing just by looking at it. Actually diamond powder is the sum of three things: the quality of the crushing boarts, the accuracy of the grading, and that vital factor that the eye can't see, the experience and integrity of the manufacturer.

When you use UNION powder you are assured of the right answer to each of the three question marks — GUARANTEED perfect grading, top-quality diamond boarts, and a quarter century's experience in making powder, not for the countless other industrial uses, but broken down in grades for use in the DIE ROOM.

And don't forget that UNION is the greatest name in diamond dies — the most economical die per pound of wire drawn.

DIAMOND DIES

DIAMOND POWDER **RECUTTING MACHINERY**

THE UNION WIRE DIE CORP.

71 West 45th St.,
New York City 19

375 Fairfield Ave.
Stamford, Conn.

Copper and Copper Alloy Springs

(*Continued from page* 397)

ammeter type where low resistance is of importance, a tin bronze of about 50% conductivity or cadmium copper having a conductivity of about 80%, is used, but for instruments of the voltmeter type or for moving-iron instruments, where resistence is of little or no importance, phosphor bronze is preferred. To a small extent nickel silver has been used in the past for the latter purpose and there is some prospect of beryllium copper being employed in the future.

* * *

WITH materials which are hardened only by cold working there appears to be only one satisfactory way of making spiral springs, which is to wind the spring to approximately its final shape, restrain it against movement and set it in position by low-temperature heat treatment. An alternative method, which would appear to be feasible but which is not in fact used, would be to wind one spring at a time on a small diameter mandrel with successive coils in contact. On release of the outer end the spiral would then open out considerably to form a spring. With the very thin strip which is sometimes used there would, however, be very little permanent set unless the mandrel were very small in diameter.

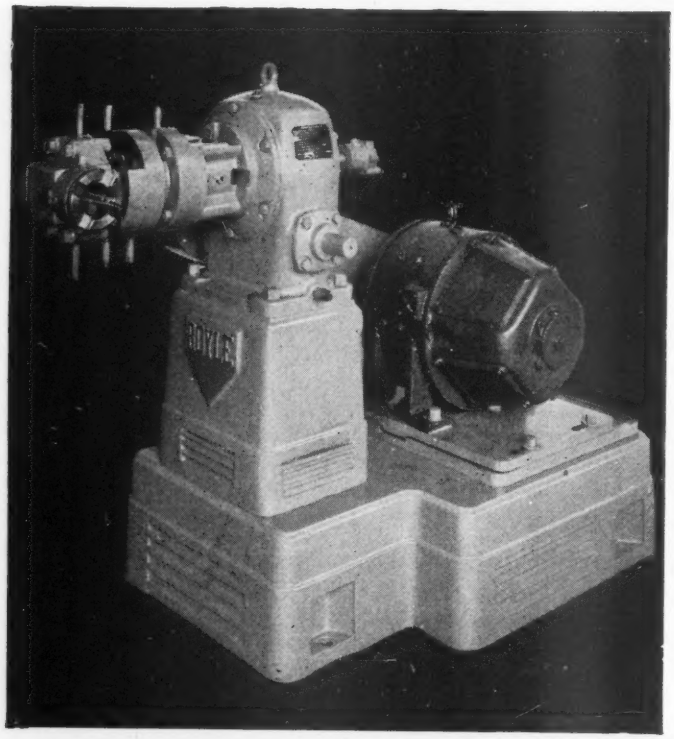
* * *

THE elastic limit of the severely hard-rolled material used for spiral springs may be raised by low-temperature heat treatment, but if the heating is continued for too long or takes place at too high a temperature, softening occurs, the elastic limit passes its maximum value and may fall to a very low figure. The advantages of this low-temperature heat treatment may be summarised as follows:

(1) **To convert the elastic strain into plastic strain and so "set" the spring in shape.**
(2) **To raise the elastic limit.**
(3) **To reduce internal stresses and so minimise stability troubles such as change of zero and elastic drift.**
(4) **To reduce or eliminate a tendency to season cracking by reduction of internal stresses.**

* * *

THE precise details of the method of manufacturing spiral springs differ considerably according to the maker, but essentially the method used is that illustrated in Fig. 9. A number of strips of the correct length are coiled by means of a handle into a small circular box or capsule which is completely filled by the strips. The number of strips is determined by the thickness of the material and the pitch of the coils, and sometimes as many as fifty



Designed for Experimental and Product Extruding

Rugged is the word to describe this compact and highly efficient Royle continuous extruding machine. It embraces all of the characteristics required for larger and heavier extruding processes.

Primarily designed to become an integral part of laboratory equipment (the technician can be sure that his experiments will have true relation to actual product extruding) the Royle #1 is an efficient producer of such commercial products as tubes, fine wire insulation, monofilament and thread coating.

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

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springs are coiled into one box, but this is exceptional. After the requisite number of boxes have been filled they are loaded into some form of container — generally a cylindrical tube of slightly greater diameter than the box. These filled tubes are then placed into a furnace where they are heated to a temperature between 250° C. and 350° C. —generally around 300° to 320° C. One such furnace is described by Ockenden [6]; it consists of a large block of metal heated by a surrounding resistance element and having three holes into which the cylinders are inserted. The object of having a large block of metal is to ensure uniformity of temperature. Another method is to surround the cylinders with charcoal. In any case access of oxygen to the springs must be prevented, and this is usually done by passing in inert gas through the furnace.

* * *

THE treatment varies with the material and with the thickness of the strip and its temper. Either the time or the temperature may be varied — the most accurate method would appear to be to regulate the temperature by a thermostat and vary the time for accurate control. Ockenden states that the whole range of useful temperature lies between 297° C. and 303° C. and control to 2° C., is essential for the best results. There figures presumably apply to a specific material and time, since it is known that wide variations from these figures do occur.

* * *

THE important point is that the springs should be only just set, since the conditions which cause softening and an appreciable reduction of the elastic limit are only slightly removed from those necessary for setting. According to Ockenden, an expansion of the spring, on removal from the capsule, of about 10% gives the best elastic results, but it has been found difficult in practice to work to such a condition.

* * *

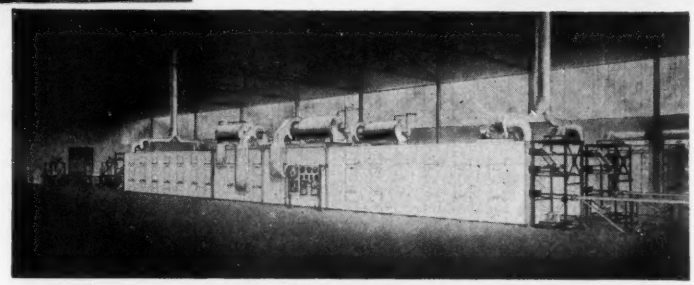
EXCESSIVE heating leads to difficulty in separating the springs after heat treatment and the inert gas used has some bearing on this. Hydrogen apparently tends to pro-

(*Please turn to page* 400)

MORE PRODUCTION
IN LESS TIME *with*
CARL-MAYER FURNACES, OVENS

CARL-MAYER HI-SPEED
ROD BAKER

The fastest rod baker built! Saves up to 50% in time and fuel. Patented Blow-Off Feature removes moisture without bumping or agitating the coils. **Patented and patents pending.**



WELDING ROD OVEN

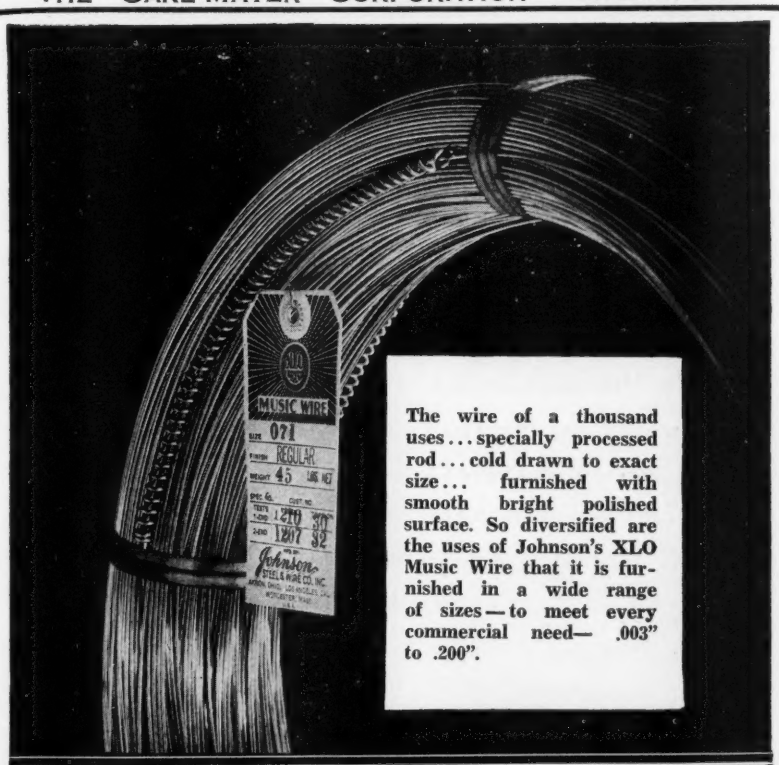
For drying coated welding rods. Uses the "Mayer" Recirculating Gas Fired Air Heater principle and Rod Transfer Systems (patents pending).

Growing interest in our type of equipment is evidenced by Carl-Mayer installations in such plants as: —

Atlantic Wire Co.
Atlas Tack Corp.
Atlas Steel Co.
Eaton Mfg. Co.
Hollup Corp.
Johnson & Nephew Ltd.
Page Steel & Wire Co.
Pittsburgh Tool Steel Wire Co.
Steel Co. of Canada
Wickwire Spencer Steel Co.

WRITE for BULLETIN No 241

THE CARL-MAYER CORPORATION
3030 EUCLID AVENUE
CLEVELAND, OHIO



The wire of a thousand uses... specially processed rod... cold drawn to exact size... furnished with smooth bright polished surface. So diversified are the uses of Johnson's XLO Music Wire that it is furnished in a wide range of sizes — to meet every commercial need— .003" to .200".

JOHNSON STEEL & WIRE CO., INC.
WORCESTER 1, MASSACHUSETTS.
NEW YORK AKRON DETROIT CHICAGO LOS ANGELES TORONTO

to tell you about it!

IT has been proved that No. 20 Galvanizing Flux offers results which hot galvanizers have been looking for. Briefly this: more *ductile*, more *adherent* coatings—at *lower operating costs.*

A letter from you will bring full details, or an H-VW-M engineer to explain all the features and advantages of No. 20 in person.

And here's additional good news: When you have the facts and have decided to try No. 20—as we think you will—you can get *prompt shipment* right from stock.

No. 20 Galvanizing Flux is modern, it's better, it's available in a hurry. Get the whole story. Write H-VW-M today.

1433

HANSON-VAN WINKLE-MUNNING CO.
MATAWAN, NEW JERSEY
Manufacturers of a complete line of electroplating and polishing equipment and supplies
Plants: Matawan, New Jersey · Anderson, Indiana
Sales Offices: Anderson · Chicago · Cleveland · Dayton · Detroit · Elkhart
Matawan · Milwaukee · New Haven · New York · Philadelphia
Pittsburgh · Rochester · Springfield (Mass.) · Syracuse

HANSON-VAN WINKLE-MUNNING CO. MATAWAN, NEW JERSEY U.S.A. SINCE 1820

NILSON

AUTOMATIC PRESS
and
FOUR SLIDE MACHINE

FOR SWAGING, STAMPING, PIERCING, BLANKING,
FORMING OF COILED METAL

We also build machines for forming Paper Clips, Buckles, Gate Hooks, Coat and Hat Hooks, Ceiling Hooks, Wire Ears, Cable Rings, Screw Eyes, Sash Chains, Automobile Side Chains, Flat Open Link Chains, Staples, Cotter Pins, Hose Clamps, Etc., and Wire Straighteners, Wire Reels, Frame Bending Machines and Special Presses.

For Complete Details Address—

THE A. H. NILSON MACHINE CO.

BRIDGEPORT, CONN., U. S. A.

Copper and Copper Alloy Springs

(*Continued from page* 399)

mote sticking, which generally means that the springs are useless since, owing to their fragility, no appreciable force can safely be applied to separate them. Oxygen-free nitrogen and carbon dioxide are quite suitable gases to use. Any access of oxygen or sulphurous fumes to the springs during treatment not only spoils their appearance and tends to cause sticking, but also renders soldering of the spring impossible since abrasive cleaning of the spring ends (both of which must be soldered) is virtually impossible. Resin-cored solder, which necessitates scrupulously clean surfaces, should be used, or a lactic acid flux, recommended by the Tin Research Institute, for which such scrupulous cleanliness is apparently not necessary. The composition of the flux, which is non-corrosive, is:

Lactic Acid	**15% by volume**
Calsolene Oil*	**0.2% by volume**
Water	**Remainder**

* * *

AS stated above there is only one generally satisfactory way of making spiral springs from work-hardened alloys, and this method can also be applied to precipitation hardening alloys such as beryllium copper. It should be realised, however, that in this case the heat treatment serves an entirely different purpose. In the case of such alloys the heat treatment has the effect of developing the highest mechanical characteristics; the relieving of internal stress does not arise. For this reason and because the spring will have a higher elastic limit it should be inherently much less susceptible to instability effects.

* Calsolene oil is a proprietary wetting agent made by Imperial Chemical Industries, Ltd.

All References will be found at the end of Part I, printed in the April 1946 *issue.*

ADVERTISING is a service to a magazine's readers. Methods, materials, and machinery were developed under the stress of war. Both editorial matter and advertisements keep you informed on what is happening in industry.

New "Hard Metals" Plant Completed by Carboloy

CARBOLOY COMPANY, INC., Detroit, announces that construction of its new "metals" plant has been completed and will be in operation as soon as necessary equipment has been installed. The new plant, designed exclusively for the production of "the hardest metals made by man" is located to the north of the present plant on 8-Mile Road in Detroit. The former plant will be devoted exclusively in future to the fabrication of hard metal products.

* * *

REMOVAL of all metal producing facilities from the original plant to the new one will provide more efficient lower cost mass production of carbide products generally, according to company officials. At the same time the increased floor space is permitting the company to enlarge its Training School, provide greater facilities for Engineering and Research, and pave the way for future expansion in metal production, when required.

* * *

PARTICULAR attention has been given in the new plant to making working conditions as near ideal as possible. In addition to the increased daylight, there are such unusual developments as:

Sintering furnaces for hardening the carbides will be equipped with suction-type hoods to draw off the heat in the Summer.

A special type of dust collecting system is being installed to maintain a pure atmosphere in the plant.

Fresh air to replace that removed by the suction systems will be heated in winter before entering the plant.

Unloading docks for trucks will be "air-locked", so that cold air will be kept out of the plant and truckers will also be able to unload in comfort in cold or rainy weather.

Mixing mills for Carboloy metals—normally considered a necessarily noisy item of equipment— will be mounted on vibration absorbing materials.

Other "noisy" equipment will be located so as to avoid concentration of noise in any particular spot. The high ceilings will also tend to reduce the noise level.

In addition to customary wash-room facilities for both men and women workers, showers are being installed in the new plant.

* * *

STANDARD & SPECIAL

TUNGSTEN — CARBIDE DIES

COLD HEADING and EXTRUSION DIES

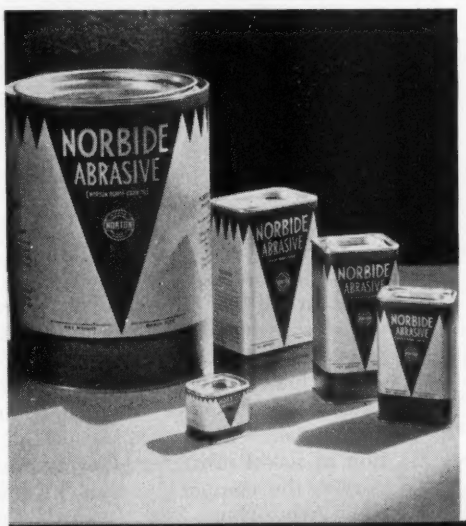
Wire Drawing Dies — Tubing Dies — Coating Dies — Sizing Dies —Ring Gauges — Cut-off Quills. Also Manufacturers of Diamond Dies & Diamond Powder.

For Immediate Delivery on Standard Boltmaker & Extrusion Dies, Wire Drawing & Tubing Dies, Address Inquiries to: —

MICHIGAN WIRE DIE COMPANY

11152 CHALMERS AVE. DETROIT 5, MICHIGAN

Phone: Pingree 5702

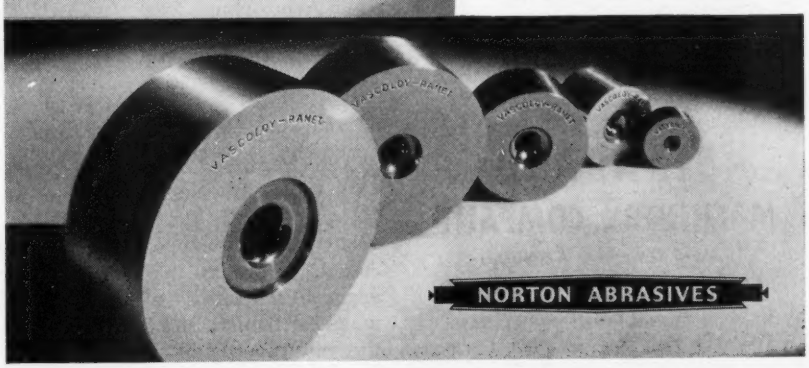


For Machine Lapping Cemented Carbide Dies Use NORBIDE* Abrasive

NORBIDE Abrasive is successfully used for the machine lapping of cemented carbide wire drawing dies — both on new dies and for refinishing. The hardest material made commercially, NORBIDE Abrasive is extremely efficient for lapping and 100 times less costly than diamond dust.

NORTON COMPANY
Worcester 6, Massachusetts

* Reg. U. S. Pat. Off.



OLD AS THE HILLS

STILL THE BEST WAY

Hammering is the time-proven method of forming or sizing metals. Through the ages men have hammered their tools and weapons, improving the structure without wasting the metal.

"Standard"

SWAGING MACHINES

"Standard" Swaging Machines bring hammering-methods up to date . . . providing 4500 blows per minute and using dies that form identical reductions of the pieces. Unskilled operators deliver smoothly finished work to exact specifications on a production basis.

Write for Catalog

STANDARD MACHINERY COMPANY

1545 ELMWOOD AVENUE

PROVIDENCE 7, RHODE ISLAND

Export Department

1111 South Ferry Bldg., New York 4, N. Y.

"Steel in the War"

A now-it-can-be-told book of the above title has been published by the **United States Steel Corporation,** in which are assembled facts and figures that measure the importance of this basic metal to national security.

* * *

THE book consists of 164 pages of illustrations and text, and while not a statistical record, it lists a volume of data that should prove permanently useful for reference material. It traces the development of many new steels which should become invaluable to our post-war economy.

* * *

"STEEL IN THE WAR" has been made available to thousands of libraries, where it may be consulted as an industrial reference volume.

* * *

P.S. Mumford Named A.M. & M. General Manager

PHILIP S. MUMFORD has been appointed general manager of the East Moline, Illinois plant of **American Machine and Metals, Inc.** In his new position, Mr. Mumford will have charge of manufacturing operations of the Troy Laundry Machinery, Tolhurst Centrifugals, Riehle Testing Machine and De-Bethezat Fans Divisions.

* * *

MR. Mumford, who recently returned from three years' active sea duty with the U.S. Navy, was previously production manager of the Ordnance Division of American Machine and Metals, Inc., where he distinguished himself in the production of naval ordnance. During this period, the company earned its initial Army-Navy "E" award for excellence in war production and subsequently was awarded three additional stars.

* * *

MR. Mumford became associated with American Machine and Metals, Inc., in 1934 and served in various sales capacities until his company became increasingly engaged in the output of war materials when he transferred his activities to the manufacturing departments.

Industrial Diamond Association Organized

TO promote the progress and development of the industrial diamond and diamond tool industry and its service to American Industry is the aim of a new trade association just formed by a group of leading industrial diamond firms. This fills a long felt need in an industry that is of increasing importance to the modern mechanical processing.

* * *

IT will be known as the Industrial Diamond Association of America, with headquarters in New York. **Athos D. Leveridge,** formerly Chief of the Diamond Dies section of the War production Board, Washington, has been named Executive Director and also Secretary-Treasurer. The charter membership of the Association is composed of manufacturers of diamond tools as well as the processors, importers and distributors of diamonds for industrial purposes.

* * *

THE Association's program of service to industry is ambitious, and it will stress the importance of research, in the use and manufacture of industrial diamond tools, that will lead to better products through which the consumer will benefit.

* * *

THE following officers and directors were elected at the organization meeting:

The President is Harvey B. Wallace, President of the Wheel Trueing Tool Company of Detroit; 1st Vice-President, I. J. Meade, Vice-President of the U. S. Industrial Diamond Corp., New York; 2nd Vice-President, Charles J. Koebel, President of Koebel Diamond Tool Co., Detroit. The Directors include Irving R. Berk of the Midwest Diamond Service, Chicago; Louis Chambre, Vice-President of Balloffet Dies & Nozzle Co., Guttenberg, N. J.; Stephen W. Hofman, formerly Chief of the Industrial Diamond Section, W. P. B., but again in private industry; Frank E. Koebel, President of J. K. Smith & Sons, Inc., New York; Harold de S. Mendes of the Mendes Diamond Sales Co.; James A. Ross, President of Sprague & Henwood Inc., Scranton; H. R. Spandel, Importer, New York; and Charles Ullman, of Associated Diamond Co., New York.

* * *

Wirebound Crates Aid Shipping Boiler Parts

ADOPTION of wirebound crates for boiler parts by the **Weil McLain Company,** Michigan City, Ind., has reduced shipping damage losses 50 per cent and shipping costs 25 per cent, **R. H. Hibner,** industrial engineer for the company announces.

ALTHOUGH much lighter in weight than the former type of containers used, the wirebounds have proved three times as strong, and the skillful use of wire gives them a resiliency that enables a product to take greater shock in shipping.

* * *

Entwistle Purchases Lyon-Vail Measuring Machine Department

TO complete their line of measuring equipment, already including machinery for measuring nearly every type of wire, cable and rope, The **James L. Entwistle Co.** of Pawtucket, R. I., have recently announced purchase of the measuring machine equipment previously manufactured by the **Lyon-Vail Machinery Co., Inc.**, of Brockton, Massachusetts, makers of textile and leather machinery.

* * *

THIS acquisition adds to the Entwistle line a machine for satisfactorily and accurately measuring wire rope, twisted-pair electrical conductors and flexible conduit.

* * *

WITH representatives in the United States, Canada and abroad, Entwistle is now in a position to expedite both sales and service of their entire measuring machine line, everywhere.

* * *

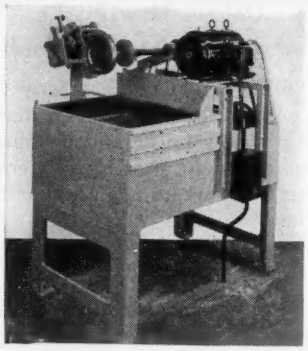
New Grinding and Lapping Catalog

A TWENTY-FOUR page catalog, No. 1843-5, has just been made available by the **Norton Company**, Worcester 6, Mass., covering their line of grinding and lapping machines, presenting briefly in picture and by word the types and purposes of each. Copies will be sent for the asking.

* * *

King Handling Fence Sales for Pittsburgh Steel.

GEORGE R. KING has been made Manager of Chain Link Fence Sales for **Pittsburgh Steel Co.**, Pittsburgh, Pa. From 1922 to 1946 he was with Cycline Fence Co., and since 1930 in charge of sales of its New York Office except for the period 1943-1945 when he served in the U. S. Army, attaining the rank of Major.



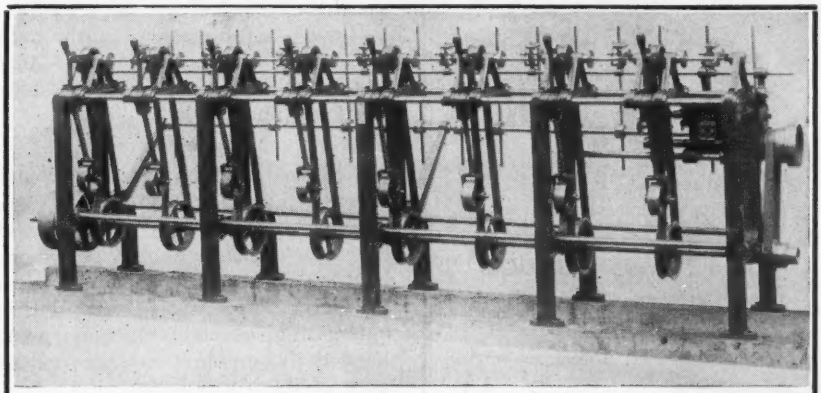
COMPLETE FINE WIRE DRAWING FACILITIES FOR SALE

All in A-1 Working Condition Ready for Operation

Large manufacturer, discontinuing department, has following wire drawing equipment for sale. Will sell either entire plant or piecemeal. Inquiries invited.

- 30 Essex Wire Drawing Machines. Each holding 20 dies. Motorized — chain drive. Will draw from .064" to .003". 16 equipped with spoolers — others with 8" diameter finishing blocks.
- 18 Richards Wire Drawing Machines. Belt driven — range .030" to .003". Holds 15 dies. All equipped with 16" diameter finishing blocks.
- 18 Waterbury — Farrel Wire Drawing Machines. Belt driven — range .020" to .003". Each holds 12 dies.
- 3 Fine Wire Drawing Machines. Belt driven — range .010" to .002". Holds 12 dies.
- 1 Vertical 16 Head Spooler. Motorized, chain driven, with variable speed control.
- 3 Horizontal 10 Head Spoolers. Motorized.
- 30 Finishing Blocks. Sizes from 8" to 20".
- 11 Single Plane Wire Straightener. Attachments.
- 3 Pot Annealing Furnaces. Gas fired. 200 lb. capacity.
- 1 14 Tube Strand Annealing Globar Furnace. Maximum operating temperature 2600° F.
- 18 Adjustable Steel Shaft Hangers and 150 feet of 1-15/16" shafting.
- 100 Split Steel Pulleys. 12" to 18" diameter.
- 25,000 Assorted Wood and Steel Spools. 2" up to 6".
- 170 Wood Reels. 16" to 20".
- 3 Motorized Wire Crimpers. Handle up to ten spools.

Further details on request. Box No. 430, WIRE AND WIRE PRODUCTS



No. 1900E SPOOLER

WIRE SPOOLING MACHINES

Model illustrated takes spools up to 12" diameter. Floor space required: 19" x 10'; length can be varied to suit largest spool specified. Handles wire up to .050" diameter. Other models made to suit specific requirements.

EMORY SPOOLERS are built for years of continuous service. Precision made, durable, rugged, dependable.

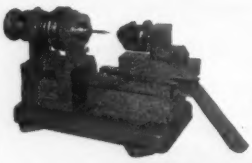
BUILDERS OF WIRE SPOOLING MACHINERY for A HALF CENTURY

For details, write to

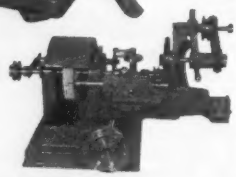
ROBERT J. EMORY COMPANY
NEWARK 5, N. J.
31 East Runyon Street
Telephone Bigelow 3-4415

NEW DIE ROOM FINISHING MACHINERY DIE ROOM TOOLS and EQUIPMENT

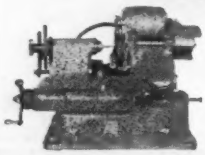
For speeding up production of Tungsten Carbide Dies and making lapping pins faster and with regular die room help. No special skill required.



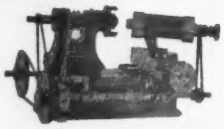
NEW DYRO PIN MAKER



NEW ROOS PIN GRINDER



NEW PARK PIN GRINDER



ROOS PRECISION GRINDER

All sizes LAPPING PINS
Prompt shipment on orders of 1 to 1,000.

And New PIN GAUGE
for fast checking pin sizes.
Write for details.

SEND FOR NEW CATALOGUE DESCRIBING LATEST ROOS EQUIPMENT FOR WIRE DIE FINISHING MACHINERY

ROOS TOOL & MFG. COMPANY
Plant and Shipping Point
17 Grove Street, Montclair, N. J.
Sales Office
49 Bloomfield Avenue, Newark 4, N. J.

Unique New Plastic Announced by Du Pont

A NEW industrial plastic that withstands acids which dissolve gold and platinum and retains its strength and form at higher temperatures than any known organic material was announced recently by the **Du Pont Company.**

* * *

IT is already contributing importantly to modern engineering developments such as the jet engine, in which it is the only plastic that will stand up under the high temperatures to which it is subjected. Radar and television are among other fields in which it is solving serious problems. No substance has been found which will dissolve or even swell the polymer.

* * *

THE plastic material, tetraflouroethylene resin — to be known by the trade-mark "Teflon" — was developed in Du Pont research laboratories.

* * *

LIMITED amounts in the forms of sheets, rods, tubes, coated wire, tape, and fabricated sections are now available for experimental purposes. Difficulty of fabrication and the high cost of manufacture are conditioning factors in the plastic's present stage of development.

* * *

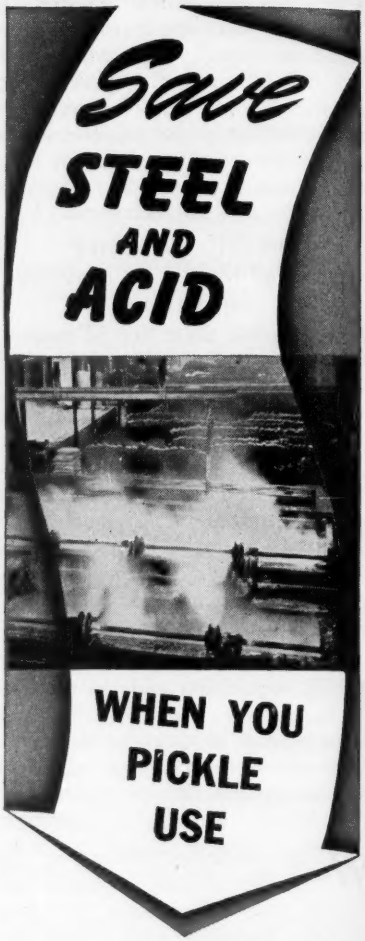
IT IS predicted that the new plastic will find use by industry where unusual resistance to solvents and corrosive agents is demanded, where heat-endurance is of paramount importance, and where insulation against high electrical frequencies is needed in combination with one or both of these properties.

* * *

GASKETS and wire insulation for jet engines are now made of this plastic, which is unharmed by temperatures ranging up to 575° F. It is also used in aircraft ignition systems near spark plugs where ordinary insulators fail at high temperatures.

* * *

CONDUITS subject to attack by corrosive materials and spacers for coaxial cables conducting extremely high-frequency circuits for radio, radar, and television are other current applications.



RODINE inhibited acid baths remove scale without dissolving clean metal—less acid is consumed. A better finished surface is produced.

Our Technical Department will gladly assist in adapting ACP Products and Processes to your manufacturing requirements. Address Dept. D-3.

American Chemical Paint Co.
AMBLER ACP PENNA.

A WATER-absorption rate so low as to be rated "zero", high impact strength, and toughness are among its other properties.

* * *

New Cleaner for Small Parts

SMALL parts in baskets are cleaned in a new two-dip immersion vapor degreaser recently added to **Detrex Corporation's** line of standard metal cleaning equipment. Designated a 500C-1, the conveyorized machine permits a choice of any one of several cleaning cycles.

* * *

WORK to be cleaned is loaded at one end of the degreaser, carried through the cleaning cycle, returned through the upper hood to the same end of the machine for unloading. The conveyor system is complete with the necessary sprockets, shafts, take-up device, speed reducer and vari-speed drive. All of the sprockets below the vapor line are zinc plated as are all of the crossrods and all of the conveyor chain.

* * *

THE complete line of 500 C-1 vapor degreasers, which have hourly work load capacities of 2000 to 4000 lbs., incorporate eight different sizes of baskets ranging in size from 8" x 18" x 6" to 18" x 36" x 12". Up to 180 baskets of parts can be cleaned each hour.

* * *

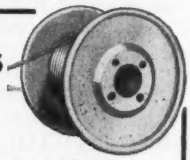
A Review of Recent Wire Patents

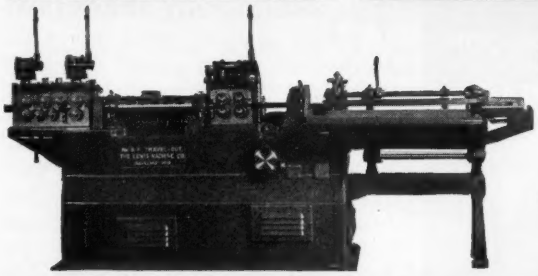
(*Continued from page* 394)

No. 2,397,291, WIRE SUPPORTING CLIP, patented March 26, 1946 by Archibald Robertson, Balboa Island, Calif., assignor to Adel Precision Products Corp., a corporation of California.

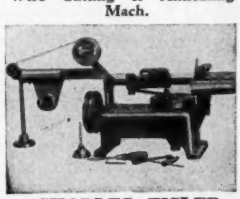
The clip has a spring wire member bent to form a series of connected wire embracing portions arranged to be sprung apart to permit of the insertion and removal of wires and to spring back into position clamping and holding the wires in an aligned group following the insertion of the wire into predetermined positions. A base plate for the member is provided, having a longitudinal groove to secure the wire member against lateral movement.

"Steelskin Brands"
Reg. U. S. Pat. Office
WIRE, TUBING, STAMPING, DEEP DRAWING SOAPS AND COMPOUNDS
For TIRE BEAD WIRE — Investigate "Steelskin" WR Coating Compound and "Steelskin" SS Wire Drawing Powder
R. H. MILLER COMPANY, INC.
HOMER, NEW YORK
Established 35 Years

APCO MOSSBERG STEEL REELS & SPOOLS

Standard Equipment for Higher Winding Speeds
Apco Mossberg Steel Reels are standard throughout the wire industry – and for good reason! Apco Mossberg – the original Frank Mossberg Co. – *originated* the steel reel idea and have been training workmen in their manufacture ever since. That is why Apco Mossberg Steel Reels are preferred where production schedules are heaviest.
FREE ENGINEERING SERVICE
We will gladly submit drawings, blueprints, or suggestions without obligation to you. Write for quotation today.
APCO MOSSBERG CO.
(The Original Frank Mossberg Co.)
21 Lamb Street . . . Attleboro, Mass.
Canadian Representative:
HUGH WILLIAMS & CO.
79 Wellington St. West
Toronto, Ontario

LEWIS TRAVELCUT WIRE STRAIGHTENING and CUTTING Machines

Machines for 1/16" to 3/4" rod
Round
Square
Flat
Hexagon
Ferrous and Non-Ferrous
Automatic
High Speed
Heavy Duty
The Sign of Dependable Service:
WE CAN SUPPLY AND ENGINEER OUR TOOLS EQUIPPED WITH CARBOLOY CEMENTED CARBIDE
The LEWIS MACHINE Co., 3445 E. 76 St., Cleveland, O.

WIRE CUTTING and SHAPING MACHINES, FINE WIRE WELDERS
We make Spot Welders from 1/4 to 500 KVA & all Types Butt Welders
Automatic Drawing and Cutting Mach.

Eisler fine wire cutting and forming machines have been in use over twenty-five years.
Wire Cutting & Annealing Mach.

CHARLES EISLER
Bench Type Butt Welder

Spot Welder

EISLER ENGINEERING CO., Newark 3, N. J.
747 So. 13th St., near Avon Ave.

TRY THIS NEW INHIBITOR FOR YOUR PICKLING SOLUTION

A new inhibitor for hot sulphuric acid pickling solutions, Oakite Pickle Control No. 3 saves time, acid, money!

Its stability at elevated temperatures is excellent. It contributes to cleaner work, less smut formation. Evolved hydrogen is reduced, fumes cut down, and hydrogen embrittlement decreased to a minimum.

Send for FREE Technical Data. Arrange for comprehensive in-plant demonstration without obligation TODAY!

OAKITE PRODUCTS, INC.
52A Thames Street, New York 6, N. Y.
Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE *Specialized* **CLEANING**
MATERIALS • METHODS • SERVICE

ACID AND ALKALI PROOF LININGS AND MORTARS

•

ACID PROOF CONSTRUCTION

•

THE CEILCOTE CO.

Consulting and Research Engineers

750 ROCKEFELLER BLDG.
CLEVELAND, OHIO

New 3-Core Solder Developed by Alpha Metals

TRI-CORE, a solder with three independently filled cores of pure rosin flux is a new development of **Alpha Metals, Inc.** This new product makes for faster soldering and elimination of dry joints, in addition to substantial savings in tin.

* * *

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* * *

TRI-CORE solder exceeds A.S.T.M. Class A specifications and is available in all alloys, all flux percentages and all gauges. Bulletins and Engineering Test Samples are available from Solder Development Division, Alpha Metals, Inc., 369 Hudson Ave., Brooklyn 1, N. Y.

* * *

Bridgeport Buys Navy Rod and Wire Mill

THE **BRIDGEPORT BRASS COMPANY** plans to make use of the Bridgeport Navy plant, recently purchased from the Navy Dept., for a rod and wire mill thereby releasing space for the expansion of the company's tube and pipe mill. This plant was built by Bridgeport in 1942 for the production of 20 mm and 40 mm cartridge cases for the Navy, extruded from rod instead of the customary technique employing strip.

* * *

Beryillium Corp. Now Producing Zirconium

THE **BERYLLIUM CORPORATION** recently began the production of high purity zicronium oxides for use in grades identified as refractory, metal, chemically pure and optical. Known uses for the oxide are as an opacifier in ceramic glazes and porcelain enamels, a catalyst in organic reactions, a constituent in chemical resistant and optical glass, pigment in plastics and as a source of other zirconium products.

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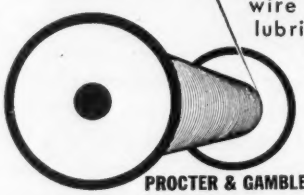

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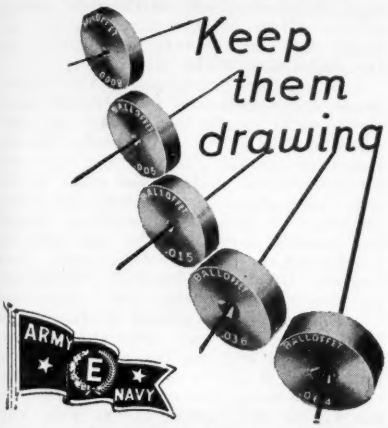

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Temperature Uniformity and Treatment of Coiled Metal

(*Continued from page* 374)

interested in production or use of more uniform metal products.

1. It is not advisable to heat or cool many layers or pieces of metal (coils, piles of sheet, castings, forgings, etc.) across air spaces, which separate the individual layers or pieces from each other. Individual exposure of each piece, as in strand annealing, is preferable.

Inasmuch as a great volume of strip metal, sheets and wire is at present heated en masse, the conclusions 2 to 8 refer to conditions encountered in heat treatment of metal in the form of piles, etc.

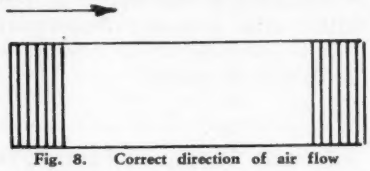

Fig. 8. Correct direction of air flow

2. In order to obtain the highest degree of thermal uniformity, necessary for manufacture of uniform products, coils of strip metal should not be heated radially, but preferably in axial direction. In costomary pot, bell type or similar furnaces, the heat flow in coils of strip metal is necessarily in radial direction, both in the process of heating and cooling.

Therefore, there is a natural limitation to the degree of uniformity in metals, heat treated in this manner. Otherwise,

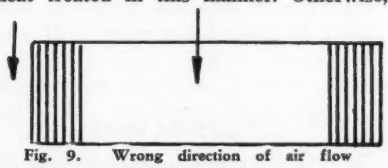

Fig. 9. Wrong direction of air flow

there would be no justification for continuously heating and cooling in strands in the processes of hardening and normalizing and annealing.

3. Circulation of the furnace atmosphere in such furnaces is of less importance than the direction in which heat is being transferred—radially of axially.

4. A better way of heating and cooling coils of strip metal is to transfer the heat uniformly to and from the top and bottom of the coil, with the heat flow in axial direction. Even when heat is uniformly transferred to top and bottom of the coil, for best results not more than two coils should be placed one on top of the other. If, however, heat is uniformerly transferred only either to top or

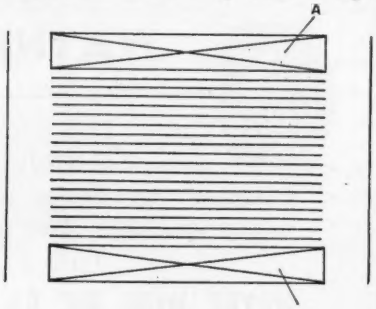

Fig. 10. Heating piles of sheets.

(*Please turn to page* 408)

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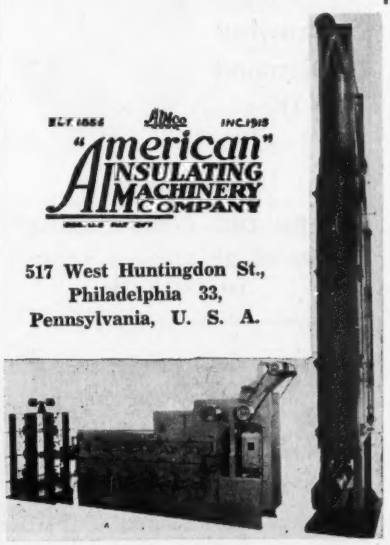

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TO provide expanded and speedier service to all users of carbide tools in the Southern California area, **Carboloy Company, Inc.**, of Detroit, has appointed the **Machinists' Tool & Supply Co.**, 3690 Santa Fe Ave., Los Angeles 11, California, as an authorized distributor.

* * *

STANDARD tools, standard blanks,, carbide tipped masonry drills, and diamond impregnated carbide grinding wheel dressers will be carried in stock.

* * *

Clarence Lundquist Takes Over for Thompson Wire

ALFRED P. LUNDQUIST has retired as general superintendent of the **Thompson Wire Co.**, Worcester, Mass., serving in that capacity for 30 yr. His son, **Clarence A. R. Lundquist,** formerly assistant superintendent, succeeds him. The father will continue with the company as consulting wire mill engineer.

* * *

It Can Be Done

A NEW production record in the openhearth department of **American Rolling Mill Co.'s** plant here was established during January when workers produced 800 tons more steel ingots than in any similar period in the plant's history. New production records were also set in the plant's cold strip mills and in several pickling, temper rolling and shearing units.

Temperature Uniformity and Treatment of Coiled Metal

(*Continued from page* 407)

bottom, then even two coils, one placed on top of the other, would be objectionable. If a high degree of uniformity is required piles of coils more than two high should be avoided because of the thermal resistance between coils. The center coil in a pile of three would lag in temperature as compared with the end coils. Heat transfer radially to the side surface of the coil is difficult to avoid, but actually has an unfavorable influence on the uniformity of the metal.

5 In case of circulation of the atmosphere, the direction of flow should be at right angles to the laminations, as indicated in Fig. 8. For best results the atmosphere should contact only top and botton, without striking the sides of the coil. Fig. 9 shows schematically the wrong direction of flow of atmosphere. Inside and outside layers of the coil will be overheated or undercooled, and heat transfer is still maintained across the air spaces and through the laminations.

6. Piles of sheets should preferable be heated or cooled only from the sides as indicated in Fig. 10; for best results in uniformity of the metal every precaution should be taken to retard heat flow to the top or the bottom of the pile. This can be accomplished either by a steel plate or, preferably, a light weight insulation, as indicated in the figure by a closed box, marked "A".

7. Piles of irregular material, such as forgings, castings, etc., are best heated and cooled by circulation of the atmosphere or in a liquid bath. With atmosphere circulation, it is important that furnace and charge be so arranged that the atmosphere is forced through the inside of the charge and is prevented from remaining merely on its circumference. Of course, as mentioned in conclusion 1, individual exposure of each piece is preferable.

8. Whereas the examples in the paper dealt with heating, the general findings and conclusions hold equally for cooling the metal. The cooling may be metallurgically of even greater importance than the heating.

ACKNOWLEDGEMENT: Thanks are due Mr. Charlie Kentnor, President of W. S. Rockwell Company, New York, for constructive criticism.

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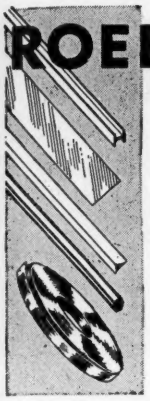

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Labor Relations

(*Continued from page* 380)

determine definitely our national policy with respect to fact-finding. If we want simply to get the truth of the issues in a controversy, that is one thing; if we want, however, to establish a governmental body which will have the power to enforce its findings and to enforce any plan that may come out of it, we must then acknowledge, freely and frankly, that what we are asking for is compulsory arbitration under government jurisdiction, and that we are destroying the freedom of both management and labor to bargain freely and collectively, as free men and women. This means settlement by bureaucratic fiat and not by collective bargaining.

* * *

(5) We believe that any settlement or any negotiation, to be equitable and to be fair to all parties involved, must be done at the local plant level wherever possible. Occasionally, there will be instances where a company-wide or, perhaps even an industry-wide settlement might be the best solution. However, insofar as it is at all possible, solutions, plans and negotiations must be at the individual plant level to be equitable to all concerned.

* * *

(6) In our human relations, it is unquestionably true that too often in the past management has been so busy with production problems and cost problems, and with the problem of making more goods and services at lower and lower costs, that in too many instances, the human element involved has been overlooked. As Mr. Henry Ford has stated, in his excellent address on "The Challenge of Human Engineering" (Detroit, Jan. 9, 1946), if we in industry can solve our human relations problem on the same basis of efficiency as we have solved our machinery production problem, this nation is in a fair way to becoming the most magnificent example ever known of human ingenuity put to work for the purpose of creating a **better living** for all.

* * *

(*Please turn to page* 410)

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Labor Relations

(*Continued from page* 409)

(7) Actually, no matter what the arguments are, no matter what the recriminations and the charges are, no matter how cost-conscious management may be, and no matter how security-conscious labor may be, the economics of the situation will, in the long run, determine the answer. Any tempering of economics of the situation must not be on the basis of what management wants, or what labor wants, or what political expediency dicates, but the great, overall public interest involved, through human accomplishment, and of human happiness in the better tomorrow.

* * *

Hussey Heads Wire Association

(*Continued from page* 381)

Program Committee for Convention

THE Program Committee for the 1946 Convention consists of the following: General Chairman: **E. W. Gundstrom;** Assistant Plant Manager, Rome Cable Corporation, Rome, New York; Chairman Ferrous Division: **John A. Moritz,** Superintendent, Wire Mills, Keystone Steel & Wire Company, Peoria, Illinois; Chairman Non-Ferrous Division: **Leroy D. Seymour,** Superintendent, Wire Division, John A. Roebling's Sons Company, Roebling, New Jersey.

* * *

THE Committee has announced the commencement of activities to secure papers and extends an invitation to all members of the Association to advise them at this time of their intention to submit papers for presentation at the Annual Convention next October. The correspondence in this connection should be addressed to Richard E. Brown, Executive Secretary, 300 Main Street, Stamford, Connecticut.

* * *

Vote of Thanks

A VOTE of thanks was extended to **D. D. Buchanan** for the many services performed by him on behalf of and for the benefit of the Wire Association during the two years he served as President.

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Non-Payment of Dues

DURING the period of organization of The Wire Association there have been only six cases of non-payment of dues. However, the Board of Directors ruled that no member could hereafter be carried who failed to pay his dues in full within six months from the due date, and the Secretary was instructed that if any such cases existed to send immediate notification.

* * *

Recommended Changes in By-Laws

AS a result of generally increased costs and a greatly increased membership during the past two years, it has been found necessary to devise a means of increasing the income of the Association.

* * *

SINCE it is a non-profit organization with income practically limited to the same amount as expenditures, the increase in income desired is only enough to cover the additional costs of operation now existing. To this end the Directors approved and recommended to the members of the Association for their approval the following changes in By-Laws:

BY LAWS—ART. 1, SEC. 3- B and C. Change Annual Dues for Active and Associated Members from $10.00 to $15.00 per year—to be effective June 1, 1946.

BY-LAWS—ART. 7. Add to Contributors.—Annual Contributors have the privilege to designate ten individual members. Any additional to be billed for Pro Rata.

ART. 6. Additional — 4 A. Each member of the Association shall receive, as included in his or its dues, a copy of "The Annual Wire Buyers Guide and Year Book of The Wire Association". To this end out of each member's Annual Dues paid in, the sum of two dollars shall be set aside for such purchase.

* * *

THESE changes, when approved by the members, should produce enough additional revenue to adequately cover the increased operating expenses of the Association.

* * *

LETTERS enclosing ballots were sent to members of the Association on or about April 10th, and when approved by the members, the changes will become effective as of June 1st, 1946.

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WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Directory, Index & Buyers' Guide.

ABRASIVES—
Norton Co., Worcester, Mass .
ACID INHIBITORS—
American Chemical Paint Co., Amber, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.
ACID-PROOF CONSTRUCTION—
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Sauereisen Cements Co., Pitts., Pa.
AIR DRAW FURNACES—
Carl-Mayer Corp., The, Cleveland, Ohio.
ALKALINE CLEANERS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
ANNEALING MACHINES—
Open Flame
Syncro Machine Co., Perth Amboy, N. J.
ANNEALING POTS AND BOXES—
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.
ARMORING EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
Morrison Engineering Corp., Cleveland, O.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.
BELTS—Wire
Wickwire Spencer Steel, New York, N. Y.
BENDERS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
BOBBINS—Braider & Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
BORON CABRIDE—
Norton Co., Worcester, Mass.
BRAKES & SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
BRICKS—Acid Proof
Keagler Brick Co., Steubenville, Ohio.
CABLE LACQUERING OVENS
Industrial Oven Engr. Co., Cleveland, Ohio.
CABLE—Steel and Copper
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Wickwire Spencer Steel, New York, N. Y.
CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
CASTINGS—Wire Mill
Scudder, E. J. Fdry. & Machine Co., Trenton, N. J.
CEMENTS—Acid Proof
Sauereisen Cements Co., Pittsburgh, Pa.
CEMENTS—Refractory
Norton Co., Worcester, Mass.
CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York ,N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.
Standard Industrial Compounds Co., Chicago, Ill.
CLEANERS—Hand and Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.
CLEANING & PICKLING EQUIP. —
Broden Construction Co., Cleveland, Ohio.
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corporation, Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.
CLOTH TESTERS—
Scott Testers, Inc., Providence, R. I.
CLOTH—WIRE. All Metals
Roebling's John A., Sons Co., Trenton, N. J.
Wickwire Spencer Steel, New York, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.
COILERS—Sheets, Strip and Wire
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J. Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
COLD HEADERS—
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.
COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., Inc., New York, N. Y.
COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Shell Oil Co., Inc., New York, N. Y.
Standard Industrial Compounds, Inc., Chicago, Ill.
COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Shell Oil Co., Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.
COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
CUTTING TOOLS—Carbide
Carboloy Co., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.
CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.
DIAMONDS—Industrial
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Michigan Wire Die Co., Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
DIAMONDS POWDERS—
Michigan Wire Die Co., Detroit, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Union Wire Die Corp., New York, N. Y.
United Die Co., Newark, N. J.
Wayne Wire Die Co., Hillside, N. J.
DIAMOND TOOLS—
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Wayne Wire Die Co., Hillside, N. J.
DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Michigan Wire Die Co., Detroit, Mich.
New Eng. Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Union Wire Die Corp., New York, N. Y.
United Die Co., Newark, N. J.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
DIES—Lead Extrusion
Robertson, John, Co., Brooklyn, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies Co., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Forth Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Co., Detroit, Mich.
New Eng. Wire Die Co., Worcester, Mass.
New Jersey Carbide Die Co., Jersey City 4, N. J.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Union Wire Die Corp., New York, N. Y.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.
DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co. McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Co., Detroit, Mich.
New Jersey Carbide Die Co., Jersey City 4, N. J.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Tungsten Electric Corp., Union City, N. J.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.
DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
New Jersey Carbide Die Co., Jersey City 4, N. J.
Rusch Wire Die Corp., New York, N. Y.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.
DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Michigan Wire Die Works, Detroit, Mich.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Tungsten Electric Corp., Union City, N. J.
United Die Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.
DRAW BENCHES—
Ruesch, H. J. Machine Co., Newark, N. J.
Scudder, E. J. Foundry & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.
DRUMS—Flange Steel
Hubbard Spool Company, Chicago, Ill.
Stevens Metal Products Co., Niles, Ohio.
DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.
DRYING & PRE-HEATING ROOMS
Carl-Mayer Corp., Cleveland, Ohio.
Industrial Oven Engr. Co., Cleveland, Ohio.
DRYING EQUIPMENT—
Carl-Mayer Corp., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.
ENGINEERS—Consulting Wire Mill
Lewis, Kenneth B., Worcester, Mass.
Sver, C. Raymond, Westport, Conn.
Wiel, L. D., New York, N. Y.
EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.
FLASH BAKER—
Morrison Engineering Corp., Cleveland, O.
FENCES AND FENCING—Wire
Wickwire Spencer Steel, New York, N. Y.

WHERE TO BUY, Continued

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.
FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M., Co., Pittsburgh, Pa.
FRICTION PAY-OFF STANDS—
Industrial Oven Engr. Co., Cleveland, Ohio.
FURNACES—Annealing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Morrison Engineering Corp., Cleveland, O.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.
FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Morrison Engineering Corp., Cleveland, O.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.
FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel Co., McKeesport, Pa.
FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.
FURNACES—Electric
Eisler Engineering Co., Newark 3, N. J.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
FURNACES—Galvanizing Equipment
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engineering Corp., Cleveland, Ohio.
FURNACES—Hard'ing & Temp'ing.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio
FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.
FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Morrison Engineering Corp., Cleveland, O.
Surface Combustion Corp., Toledo, Ohio.
FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Morrison Engineering Corp., Cleveland, O.
Surface Combustion Corp., Toledo, Ohio.
FURNACES—Salt Bath
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corporation, Toledo, O.
FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark 3, N. J.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Morrison Engineering Corp., Cleveland, O
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.
GALVANIZING EQUIPMENT—
Hanson-Van Winkle Munning Co., Matawan, N. J.
GALVANIZING FLUXES
Hanson-Van Winkle Munning Co., Matawan, N. J.
GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.
GOVERNMENT SURPLUS MATERIALS
War Assets Corporation, New York, N. Y.
GRINDERS—Roll
Norton Co., Worcester, Mass.
HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M. Co., Pittsburgh, Pa.
INSULATING LACQUERING SYSTEMS—Continuous
Industrial Oven Engr. Co., Cleveland, O.
INSULATING MATERIALS—
Crepe-Kraft Co., Newark, N. J.
Du Pont de Nemours, E. I. Co., Wilmington, Del.
Standard Vanish Wks., Staten Island, N. Y.

KETTLES—Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Penna.
LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.
LININGS—Acid and Alkali Proof
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.
LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Phila., Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Procter & Gamble, Cincinnati, Ohio.
Standard Industrial Compounds Co., Chicago, Ill.
MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Patterson, N. J.
MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
MACHINERY—Brazing
Syncro Machine Co., Perth Amboy, N. J.
MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
MACHINERY—Chain Making
Nilson, A. H., Mach. Co., Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
MACHINERY—Coilers
Broden Construction Co., Cleveland, Ohio.
Eisler Engineering Co., Newark 3, N. J.
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
MACHINERY—Copper Wire Drawing and Rolling
American Insulating Mach'y Co., Phila., Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
MACHINERY—Cutting
Broden Construction Co., Cleveland, Ohio.
Eisler Engineering Co., Newark 3, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Inc., Cleveland, Ohio.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Mach. Co., Bridgeport, Conn.
Porter, H. K., Inc., Everett, Mass.
Shuster, F. B. Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Roos, H. & G., Tool & Mfg. Co., Montclair, N. J.
Union Wire Die Corp., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
MACHINERY—Draw Benches
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
MACHINERY—Edging
Broden Construction Co., Cleveland, Ohio.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Oven Engr. Co., Cleveland, O.
Syncro Machine Co., Perth Amboy, N. J.
MACHINERY—Extruding
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
MACHINERY—Fence
Broden Construction Co., Cleveland, Ohio.
Glader, Wm., Machine Works, Chicago, Ill.
MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark 3, N. J.
MACHINERY—Flat Wire
Broden Construction Co., Cleveland, Ohio.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
MACHINERY—Forming
Eisler Engineering Co., Newark 3, N. J.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Mach. Co., Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Seifert, E. R., Inc., Syracuse, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.
MACHINERY—Galvanizing
Wilson, Lee, Engineering Co., Cleveland, O.
MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.
MACHINERY—Gang Winders
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co, Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
MACHINERY—Grinding
Norton Co., Worcester, Mass.
MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Royle, John, & Sons., Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
MACHINERY—Lead Encasing Presses, etc.
Robertson, John Co., Brooklyn, N. Y.
MACHINERY—Lead Stripping
Robertson, John Co., Brooklyn, N. Y.
MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
MACHINERY—Material Handling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Lyon-Vail Machine Co., Brockton, Mass.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
MACHINERY—Nail and Tack
Broden Construction Co., Cleveland, Ohio.
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.

WHERE TO BUY, Continued

Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach., Co., Trenton, N. J.
Sleeper & Hartley, Inc, Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
Royle, John & Sons, Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio.
Emory, Robert J., Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark 3, N. J.
Emory, Robert J., Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, Ohio.
Lewis Machine Co., The, Cleveland, Ohio.
Moslo Machinery Co., Cleveland, Ohio.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Mach. Co., Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N J.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, Ohio.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Swaging
National Machinery Exchange, (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, Jas. L., Pawtucket, R. I.

MACHINERY—Testing Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark 3, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark 3, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Industrial Oven Engr. Co., Cleveland, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark 3, N. J.
Nilson, A. H., Machine Co., Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila.,Pa.
Broden Construction Co., Cleveland, Ohio.
Eisler Engineering Co., Newark 3, N. J.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., Torrington, Conn.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Procter & Gamble, Cincinnati, Ohio.
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Industrial Oven Engr. Co., Cleveland, Ohio.
Morrison Engineering Corp., Cleveland, O.

OVENS—Dehydrogenizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Oven Engr. Co., Cleveland, Ohio.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Oven Engr. Co., Cleveland, Ohio.
Morrison Engineering Corp., Cleveland O.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Oven Engr. Co., Cleveland, Ohio.
Morrison Engineering Corp., Cleveland, O.
Moslo Machinery Co., Cleveland, Ohio.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER—For Coil Wrapping and Corrosion Prevention
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS
Scott Testers, Inc., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING TANK LININGS—
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Keagler Brick Co., Steubenville, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

PIPES & FITTINGS—Acid Resistant
Ceilcote, Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

POTS—Lacquer
Industrial Oven Engr. Co., Cleveland, O.

POTS—Lead Melting
National Annealing Box Co., Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc, Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REEL AND TENSION STAND—
Industrial Oven Engr. Co., Cleveland, O.
Moslo Machinery Co., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WHERE TO BUY, Continued

Stevens Metal Products Co., Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Stevens Metal Products Co., Niles, Ohio.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Morrison Engineering Corp., Cleveland, O.
Moslo Machinery Co., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

RODS—Stainless Steel—
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pitts., Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton,
Wickwire Spencer Steel, New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

ROLL STRAIGHTENERS—
Moslo Machinery Co., Cleveland, Ohio.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pitts., Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Spencer Steel, New York, N. Y.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Oakite Products, Inc., New York, N. Y.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Heil Engineering Co., Cleveland, Ohio.
Standard Industrial Compounds Co., Chicago, Ill.

SATURATION SYSTEMS—
Industrial Oven Engr. Co., Cleveland, O.
Watson Machine Co., Paterson, N. J.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Phila., Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Procter & Gamble, Cincinnati, Ohio
Shell Oil Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Oven Engr. Co., Cleveland, O.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

SPRINGS—Steel
Wickwire Spencer Steel, New York, N. Y.

SPRINGS—Tools for Forming
State Machine Tool Co., Hartford, Conn.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRAND—Steel and Copper
Wickwire Spencer Steel, New York, N. Y.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pitts., Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire Spencer Steel, New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANK LININGS—Brick
Ceilcote Co., The, Cleveland, Ohio.
Keagler Brick Co., Steubenville, Ohio.

TANKS—Compound
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corp., Newark, Del.
Heil Engineering Co., Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro Mass.
National Annealing Box Co., Washington, Penna.

TESTING INSTRUMENTS—
Davis, R. L., Electric Co., Wallingford, Conn.

TOOLS—Spring Forming
State Machine Tool Co., Hartford, Conn.

TOOLS—Wire Cutting
Porter H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Hubbard Spool Company, Chicago, Ill.
Stevens Metal Products Co., Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Co., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

TREADS—Safety
Norton Co, Worcester, Mass.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power
Standard Machinery Co., Providence, R. I.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—For Insulation
Standard Varnish Wks., Staten Island, N. Y.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp. Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark 3, N. J
Micro Products Co., Chicago, Ill.
Moslo Machinery Co., Cleveland, Ohio.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila., Pa.
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Oven Engr. Co., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh, Pa.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pitts., Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A. Sons, Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled for Coils
North American Philips Corp., Dobbs Ferry, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester 1, Mass.
Jones & Laughlin Steel Corp., Pitts., Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A. Sons. Co., Trenton, N. J.
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.
Wickwire Spencer Steel, New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Music
Johnson Steel & Wire Co., Inc., Worcester 1, Mass.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.

WIRE—Non-Ferrous to Specification for Special Purposes
Hudson Wire Co., Ossining, N. Y.
North American Philips Corp., Dobbs Ferry, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester 1, Mass.
Jones & Laughlin Steel Corp., Pitts., Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Rustless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.
Wickwire Spencer Steel, New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE—Stainless Steel
Firth-Sterling Steel Co., McKeesport, Pa.
Rutless Iron & Steel Div., American Rolling Mill Co., Baltimore, Md.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester 1, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Wickwire Spencer Steel, New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, Ohio.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining N. Y.

WIRE WINDER—
Standard Mill Supply Co., Providence, R. I.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARNS & TAPES—
Du Pont de Nemours, E. I. & Co., Wilmington, Del.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

Wire & Wire Products

May, 1946.

ELECTRICAL WIRE AND CABLE AND WIRE ROPE MACHINERY

STRANDERS - TYPE "TH"

PATENTS 1502218, 1775707, 1867688 and PAT. PENDING

The 46-Spool (in rotor) High Speed Tubular Stranding Head shown here — our Size TH6-8 — is of recent design. It is arranged for spools to 12" Flange Dia. x 7" over-all tip-width. A 40 H.P. Motor operates it at 520 R.P.M. The Head floor space is 3'6" Width x 102'1" Length. A 36" Capstan Section and a 48" Takeup with automatic Traverse complete the Machine. Total Machine Length is 117'9". Further details are listed under their respective captions:

ROTOR — Fully machined tube, welded - in spiders, dynamically balanced rotor assembly.

BRAKES — Automatic 3-SECOND Shoe Type — Spring Set — Air Off, Push Button or Foot Switch Stations release brakes for "hand-inching".

SPIDERS — 3-Leg "Single" Spiders greatly facilitate threading from cradle nose to rotor guide.

CRADLES — Cast Steel "Boat Type", Low wire angles, greatest ease of assembly and removal.

CRADLE-LATCHES — New Design "ONE-HAND SQUEEZE-GRIP" operated. Self-locking on grip release. Double latched through connected lever rod.

WIRE-GUIDES — ALL TUNGSTEN CARBIDE. CURVED (large radii) UP and DOWN and FLEXING Nose Guides. NO GUIDE SHEAVES are used.

WIRE-ANGLES — From full spool to Cradle Nose - and - from Cradle Nose Guide to Rotor Guide, 35-DEGREES MAXIMUM with standard Spools.

SUPPORT-ROLLERS — "Spall resisting" Laminated Phenolitic Material. Ball Bearing Eccentric Mounts for ease of adjustment and allows "feel-setting" during operation. Trapped air escape grooves for quiet operation. Closely guarded.

MACHINE-BASE — SOLID FABRICATED STEEL BOXES. Stress relieved prior to top surface machining. Rigid in Bending and Torsion. Proper alignment of all rotor supports insured.

STOPS — Automatic low voltage LAY HEAD and LINE STOPS complete with relay and transformer for automatic control of Drive Motor and Brakes.

MOTOR-DRIVE — Quiet, shock-less V-Belt Drive to rotor periphery. Motor mount hinged for belt-tensioning. Designed for minimum machine length.

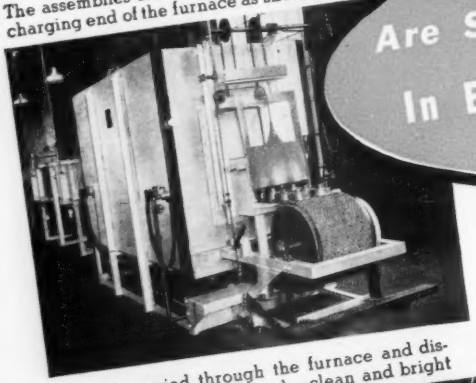
DIE-HOLDER — Dimensioned to suit customers' requirements. Long after-space on die slide for post forming.

CAPSTAN — Double-Grooved, both wheels driven, "TILTED" design for 36" (4-ton Haul Pull) and larger capstan sections.

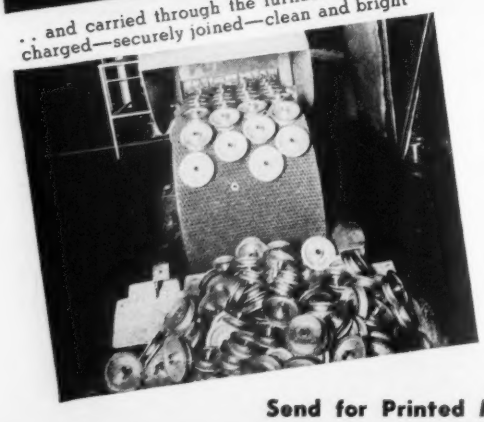
TAKE-UP — Mechanical Lift Type (drive always in mesh), Oil-immersed multi-disc Slip Friction, 2-speed slip by selective slide gear transmission, infinite tension adjustment during operation, manual "slack-take-up" drive with automatic return to machine drive on release of drive handwheel.

Aluminum, Brass, Steel and Other Assemblies Are Securely and Economically Joined In EF Soldering and Brazing Furnaces

The assemblies are loaded on a conveyor at charging end of the furnace as shown below



. . and carried through the furnace and discharged—securely joined—clean and bright



Products ranging in size from small intricate assemblies weighing a fraction of an ounce up to large assemblies weighing several pounds are being neatly and securely joined in EF continuous and batch type brazing and soldering furnaces.

Products which otherwise would be difficult or expensive to make in one piece can be made in several pieces and joined — thus not only reducing the cost but actually improving the quality and appearance.

Products requiring several stampings joined or requiring screw machine parts, forgings and stampings to complete the unit, can be neatly and economically joined right in your production line.

Strong, leak-proof joints are made and the completed unit is discharged from the furnace — clean and bright.

Any number of joints in the same product or any number of pieces can be joined at one time. The most intricate parts or assemblies are handled and the joints are as strong, and in some cases even stronger than the original parts.

Investigate This Process for Joining Your Aluminum, Brass, Copper or Steel Parts

We will be glad to put samples of your products through one of our furnaces to show you the results you can expect, and give you an estimate on the cost of the equipment to handle your products and production, together with operating cost, etc.

Send for Printed Matter Showing Various Types of EF Brazing Furnaces.

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production